

Zakharkina, Liudmyla; Rubanov, Pavlo; Alibekova, Balsheker et al.

Article

The impact of digital transformation in the accounting system of fuel and energy complex enterprises (International Experience)

International Journal of Energy Economics and Policy

Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEEP)

Reference: Zakharkina, Liudmyla/Rubanov, Pavlo et. al. (2022). The impact of digital transformation in the accounting system of fuel and energy complex enterprises (International Experience). In: International Journal of Energy Economics and Policy 12 (5), S. 152 - 161.
<https://econjournals.com/index.php/ijEEP/article/download/13317/6912/31145>.
doi:10.32479/ijEEP.13317.

This Version is available at:

<http://hdl.handle.net/11159/12612>

Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
<https://www.zbw.eu/econis-archiv/>

Standard-Nutzungsbedingungen:

Dieses Dokument darf zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen dieses Dokument nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen. Sofern für das Dokument eine Open-Content-Lizenz verwendet wurde, so gelten abweichend von diesen Nutzungsbedingungen die in der Lizenz gewährten Nutzungsrechte.



<https://zbw.eu/econis-archiv/termsfuse>

Terms of use:

This document may be saved and copied for your personal and scholarly purposes. You are not to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public. If the document is made available under a Creative Commons Licence you may exercise further usage rights as specified in the licence.



The Impact of Digital Transformation in the Accounting System of Fuel and Energy Complex Enterprises (International Experience)

Zakharkina Liudmyla^{1*}, Rubanov Pavlo¹, Alibekova Balsheker², Zakharkin Oleksii¹,
Moldashbayeva Luiza³

¹Department of Financial Technologies and Entrepreneurship, Sumy State University, 2, Rymskogo-Korsakova St., 40007 Sumy, Ukraine, ²Department of "State Audit", Faculty of Economics, L.N. Gumilyov Eurasian National University 010000, Kazakhstan, ³Department of Accounting and Analysis, L.N. Gumilyov Eurasian National University Kazhymukana 11, Nur-Sultan, Republic of Kazakhstan. *Email: l.zakharkina@biem.sumdu.edu.ua

Received: 16 May 2022

Accepted: 21 August 2022

DOI: <https://doi.org/10.32479/ijeep.13317>

ABSTRACT

The global fuel and energy market occupies a significant position in international trade, which encourages companies in the industry to carry out a digital transformation in the supply chain and accounting of related transactions. Digital transformation occurs through the introduction of modern information technology, which leads to increased productivity at all stages of the supply chain in the fuel and energy sector and simplified accounting of transactions. Positive processes are characterized by the convergence of markets, and negative processes are characterized by the fragmentation of energy markets and their isolation at the national level. To solve these problems in the field of accounting, it is necessary to constantly improve ERP systems based on the creation of a unified ecosystem of the fuel and energy sector. The world practice of using Enterprise Resource Planning products in the fuel and energy sector is considered. Based on the trend and structural analysis world oil and gas imports have been investigated to determine the dynamics and geographical structure of the fuel and energy market. The forecast of the dynamics of oil imports is made. The article proposes a functional model of the supply chain in the energy sector based on blockchain technology. The article defines digital technology with a focus on blockchain and artificial intelligence. The process method is used in the formation of an invoice generation model. The advantages of ERP systems are identified and global experience in invoice generation in accounting is summarized. The OpenText Vendor Invoice Management (VIM) software product is characterized, allowing its integration with the SAP ERP invoice accounting and payment system. The main issues of digital transformation in the accounting system, stimulating the improvement of specialists' competencies when working with digital platforms, are identified.

Keywords: Digital Transformation, Energy Sector, Energy Supply Chain, Enterprise Resource Planning, Accounting, Invoice

JEL Classifications: F10, G20

1. INTRODUCTION

The new energy economy involves diverse and often complex interactions between electricity, fuel, and storage markets, creating new challenges for regulation and market structure. The key question is how to manage the potential for increasing variability on both the demand and supply sides of the energy mix. Digital

technology plays a crucial role in integrating different aspects of the new energy system. Sectors that have hitherto operated largely independently (e.g., electricity and transportation) are becoming linked in new ways to the growth of electric mobility, and the networks need to cope with a much greater diversity and complexity of flows as many new players, including households, enter the market. Managing the platforms and data needed to run

this system efficiently is becoming a central part of the new energy economy, as well as mitigating the associated risks of cybersecurity and data privacy (IEA, 2021).

The emergence of sophisticated digital technologies has turned the traditional way of doing business upside down through a comprehensive transformation (Barna et al., 2021). With today's smart data, organizations need to embrace the new digital world by evolving through digital transformation (Duch-Brown and Rossetti, 2020). Digital transformation consists of companies creating digital platforms that represent an innovative business model for integrating participants' business processes and transactions.

UNCTAD's (2019) DIGITAL ECONOMY REPORT 2019 indicates that transactions can be carried out by multilateral markets between transaction platforms and innovation platforms through advanced online infrastructure. This process is actually a transition from digitalization to digital transformation, where transactions and transactions are carried out on universal digital platforms. But already UNCTAD's Report, (2021) for 2021 notes that approaches are quite different around the world with respect to the digital economy and data management regulations, and also differ in their global impact. The politics of cross-border data flows differ according to economic, social, political, institutional and cultural attitudes and values. Most notably, the "cyber sovereignty model" advocated by China and the Russian Federation contrasts sharply with the "free flow of information" model advocated by the United States. In addition, the European Union's model of digital sovereignty is inconsistent with the United States' model of data governance. Finally, developing countries such as India advocate digital economic development and data governance models based on data storage within national borders. There have been negative developments in regional markets, leading to a fragmentation of the digital space across political, commercial and technical perspectives, as outlined in the report of WEF, (2020) and works of Drake et al. (2016).

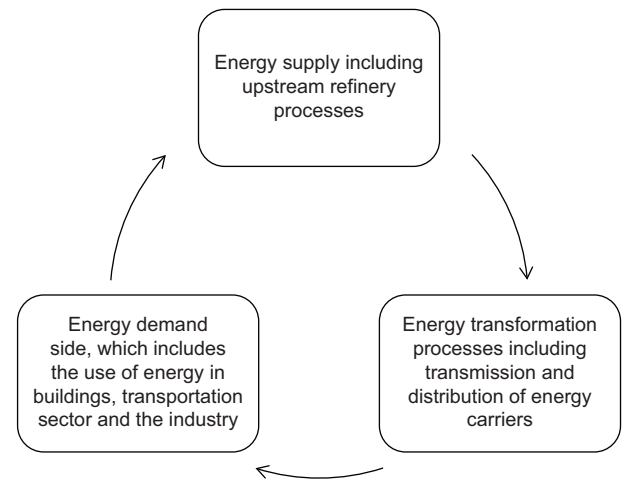
World experience shows that the global energy market is simultaneously experiencing convergence within a single energy policy, as in the EU countries, or fragmentation, i.e., isolation of national energy markets, as in China, the Russian Federation, and India.

2. LITERATURE REVIEW

In the structure of international trade, some markets have become global, and the movement toward fragmentation complicates the processes of recording transactions, conducting transactions, insurance, etc. Such markets include the fuel and energy sector, which acts as a base for the whole manufacturing industry, transport, and household consumption. A simplified model of the supply chain in the fuel and energy sector can be outlined as follows (Figure 1).

In the real model, rather complex processes arise and systems with different standards are connected, which requires digital transformation to use modern digital technologies such as

Figure 1: The energy supply chain



Source: Developed by the authors according to: Hossein Motlagh, N., Mohammadrezaei, M., Hunt, J., & Zakeri, B. (2020)

blockchain, Internet of Things, artificial intelligence, virtual reality, etc. Accounting operations must take into account technological innovations and standards, the introduction of new accounting devices and regulatory systems.

A collective study by leading economists Gopal et al. (2018) presents the energy sector (fossil fuel) supply chain by North American Industry Classification System (NAICS) codes thoroughly in tabular and schematic form. in industry sectors. The article describes the opportunities for China as an energy market leader in the M&A process.

According to Amanova et al. (2020) energy industry is more susceptible to constant forecasting and planning, because the current state energy policy depends on the knowledge of available and consumed energy resources in the future.

In today's environment, forecasting and planning activities in the fuel and energy sector need to improve ERP systems with digital technology, which helps timely decision making and resource accounting.

Ahmad et al. (2021) show that new competitors, new business strategies, and a more proactive approach to customers will require informed and flexible regulatory exposure with the related complexities of customer security, privacy, and information security. Given the pace of advances in information technology, artificial intelligence, and data analytics, regulatory approvals for new services and products in the new era of digital energy markets can be secured as quickly and efficiently as possible.

A collective study by Yi et al. (2021) concerns energy trading technology based on the Internet of Things (IoT). However, in the process of energy trading, it is easy to expose the user's personal privacy. To solve the problem of privacy leakage in IoT energy trading system, a secure energy trading method based on blockchain technology and homomorphic encryption technology is proposed.

Petratos and Faccia (2021) propose an innovative architecture based on distributed ledger (blockchain) and triple-accounting (X-Accounting) technologies. The proposed architecture, focusing on new payment and billing applications, will improve accountability and compliance as well as security and reliability. Future research could extend this architecture to other energy technologies and systems, such as EMS/SCADA and related programs.

Deloitte analysts, (2017a) note the complex nature of digital transformation in supply chains: “Building supply chain capabilities with digital technology can result in greater levels of performance. Blockchain is enabling technology, which is most effective when coupled with other next-generation technologies such as the Internet of Things (IoT), robotic cognitive automation, or smart devices. Experts insist on digital transformation, the implementation of which in all industries leads to improved performance of enterprises. The practical significance of the analytical report is to build models of digital transformation of the supply chain based on the use of blockchain technology”.

Meanwhile et al. (2020) will raise concerns about the implementation of digital technology, as it leads to cybercrime, tax evasion, concealment of official income, etc. In this context, digital shadow transactions as part of the shadow economy, which involves illegal or shadowy online commerce or services, are becoming widespread. However, technological innovations in the financial sector, on the contrary, contribute to the reduction of shadow transactions as prerequisites for the control and movement of funds in accounts.

Analyzing digital skills in hiring Lyu and Liu, (2021) examined job postings collected between 2010 and 2019 and showed that among emerging digital technologies (e.g., artificial intelligence, big data, Internet of Things, robotics, blockchain technology, and cloud computing), artificial intelligence is most prevalent in the energy sector.

Current research by Mihai et al. (2022) shows that the digitalization of the energy sector to improve sustainability is a complex process that brings many changes, some of which have been accelerated by the COVID-19 pandemic. In many cases, this has led to quick decisions to limit or eliminate interactions between customers and energy producers by providing digital channels for invoice delivery, making charges, and payments, installing sensors, redesigning certain processes, setting up digital meters, and developing intelligent control platforms, a platform for reporting power problems, etc.

3. METHODS AND DATA

The fuel and energy sector is decisive in the development of national economies, so it has always been the leader in the implementation of digital technologies. The dynamics of the fuel and energy sector is characterized by the trend analysis method. The forecast of oil imports was built using the logarithmic equation. The geography of oil and natural gas imports by the top 10 countries was characterized by the structural method.

In today's world, the demands on the IT competencies of a management accountant have grown: recommending and implementing an appropriate system in a complex environment, integrating information and managing system performance, developing Enterprise Resource Planning workflows for reliable financial control, creating customized reports, analyzing data with business intelligence software, implementing new technology platforms as they become available, creating flowcharts using specialized software for the management accountant. Therefore, the study of digital accounting competencies should take an integrated approach based on the study of functional modules of ERP systems.

A modern ERP system consists of functional modules, each of which covers a specific area of business management. For example, sales entry automatically creates a double-entry accounting entry in the sales ledger with automatic calculation of collected VAT.

Rouissi (2020) stresses that Germany is the world's leading provider of cross-corporate software and the third-largest software provider in the world. Today, SAP employs more than 28,900 people in more than 50 countries. It consists of a set of modules adapted to the needs of different industries (aviation, chemistry, electronics, mechanics) or services (insurance, banking, health care, etc.).

The use of the structural method and functional approach in the study of ERP systems will make it possible to identify the advantages of each module, determine its functional purpose, advantages, and disadvantages, as well as opportunities for use in accounting.

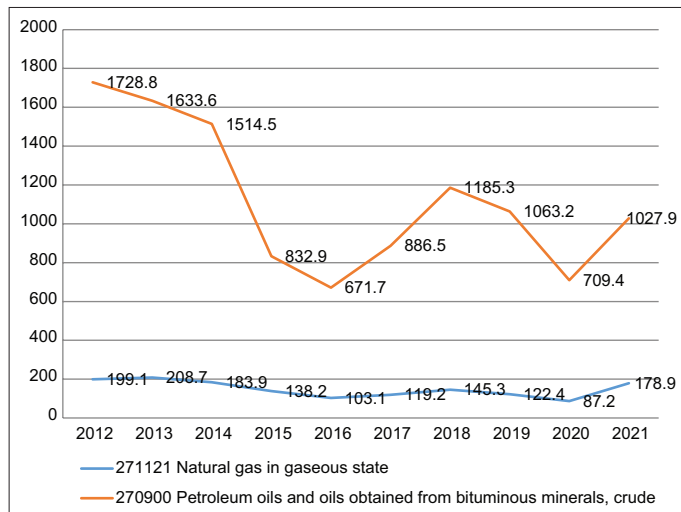
4. RESULTS AND DISCUSSION

The current scale of the global fuel and energy market will be considered using the example of oil and gas, although the share of the alternative energy market is growing, but its scale is still small. According to TradeMap, global imports of goods reached \$21,875.4 billion. US \$21.875.4 BILLION. World oil imports in 2021 reached 4.7%, global imports of natural gas amounted to 0.8% of total world imports. So, together, oil and natural gas imports in 202 reached a share of 5.5% of world imports.

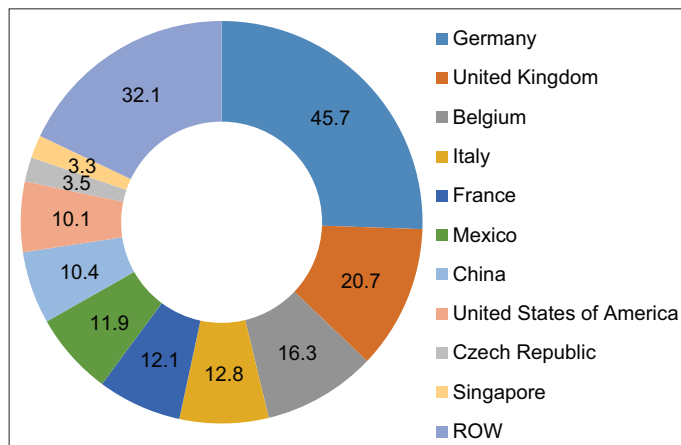
The global dynamics of oil and gas imports are shown in Figure 2.

The dynamics of natural gas and oil imports reflect the unsustainable trend of oil purchases, which is due to the problems of the energy transition. But the energy transition is due to a gradual shift away from carbon-based fuel resources, which is reflected in the projected decline in oil imports. Compared to oil, natural gas imports are trending more steadily, but there is a correlation with oil imports. The introduction of digital tools is always initiated by the major market players. The geographical structure of gas imports is shown in Figure 3.

Analyzing the geographical structure of the global market according to Figure 3 for 2021, we see that Germany accounts for the bulk of natural gas imports with a share of 25.5%, and the top

Figure 2: World oil and gas imports, \$ billion U.S.

Source: Calculated by the authors based on the data of: https://www.trademap.org/Country_SelProduct_TS.aspx?nvpm=

Figure 3: Geographic structure of gas imports in 2021, \$ billion U.S.

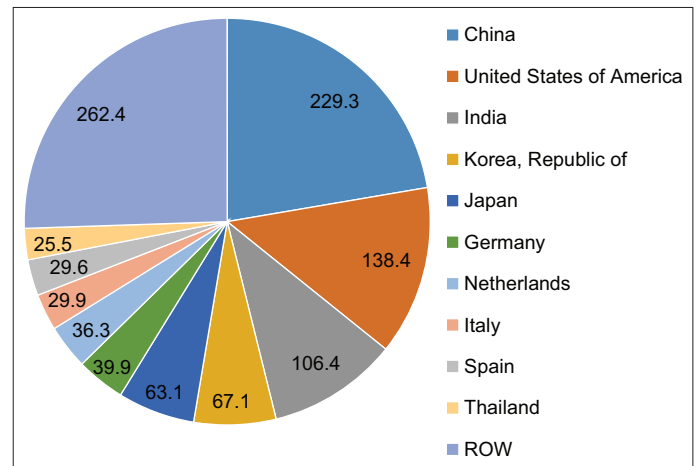
Source: Calculated by the authors based on the data of: https://www.trademap.org/Country_SelProduct_TS.aspx?nvpm=

10 countries have a share of 82%, which corresponds to the Pareto law. The geographic structure of oil imports is shown in Figure 4.

Based on the data of Figure 4, the above statistics on the analysis of the geographical structure of oil imports for 2021 shows that the leader is the Chinese economy with a share of 22.3%. The top 10 countries in terms of crude oil imports account for almost 75%.

Accounting in the context of digital transformation requires continuous improvement at the software level from the needs of fuel and energy companies to energy efficiency accounting systems (EEAS). Improving employee competencies in the energy transition requires clear tasking and defining the benefits of working with a new product (Mihai et al., 2022).

ERP systems are an asset to many organizations. They simplify business operations by consolidating and securing information, automating processes, and creating easy-to-understand reports. With these and many other features, the benefits of ERP systems in an organization make current operations and long-term planning

Figure 4: Geographic structure of oil imports for 2021, \$ billion U.S.

Source: Calculated by the authors based on the data of: https://www.trademap.org/Country_SelProduct_TS.aspx?nvpm=

more efficient. Analyzing the work of Heinzelmann (2019) Digitalizing Management Accounting, which outlines the trends of digital transformation in management accounting, the benefits of organizations using ERP systems should be noted.

The benefits of ERP are:

4.1. Targeted IT Expenses

Although ERP software often requires a large investment, it can consolidate IT costs and increase efficiency. Instead of spending resources on multiple systems that require dedicated staff, infrastructure, support teams, and licenses, you can focus all of these costs on a single ERP system.

Using a single system also reduces training requirements for end users because they only need to learn one system rather than interacting with multiple applications.

Although ERP can include many functional areas, such as customer resource management (CRM), accounting, human resources, and supply chain management, the design of the system should be modular. This allows you to use the parts that meet your needs. Some ERPs allow you to integrate multiple third-party systems into a single unit.

Integrating MES, CRM, and other subsystems into a single planning system allows you to simplify processes and increase productivity in the first place.

4.2. Full Traceability of Processes

This advantage of ERP is one of the major benefits of the software. ERP software provides full access to all important business processes, making data from each department easily accessible to senior management.

For example, you can track inventory levels on a daily basis, including future shipments that have not yet been received and inventory in transit, allowing you to monitor your working capital at a more accurate level.

4.3. Improved Reporting and Planning

Along with improved visibility, a better understanding is an important benefit of ERP software. Implementing an ERP package across departments means that the organization has a single unified reporting system for each process. With a single source of reliable information, the ERP system can easily generate useful reports and analytics at any time (Yi et al., 2021). This software allows you to analyze and compare the functions of different departments without having to worry about multiple spreadsheets and emails. One of the most popular reports concerns finance. Standard financial reports, such as income and cash flow reports, are usually built in, and user reports can be quickly created without IT intervention. ERP allows users to access complex reports.

4.4. Flexible Modularity

One of the biggest advantages of enterprise resource planning software today is its modular structure. Most ERP vendors offer several programs that can be implemented together according to business needs, as shown in Figure 2. Each application is designed to work independently or integrate with a larger package.

4.5. Increased Efficiency

Advanced technologies such as artificial intelligence (AI), machine learning, robotic process automation (RPA), and others support the automation and intelligent offering capabilities used in many ERP software programs. This advanced feature allows you to manage business operations such as demand forecasting, creating purchase orders, and tracking items from production to delivery.

4.6. Customer Service

Your company's customers also get the benefits of an ERP system, even if they don't know it. Because customer information is centralized and organized, your sales team will be able to focus on building and maintaining customer relationships rather than maintaining spreadsheets. At the end of the day, the number one business has to worry about attracting and retaining customers. With the end-to-end tracking and analytics offered by ERP, you can improve customer interactions from marketing automation to late-stage customer service.

4.7. Data Security and Quality

One of the biggest benefits of an ERP system is data security. Sharing data between different functional departments, such as customer service, sales, marketing, and business development, improve collaboration across the company. The other side of broad data access is control over who can view and edit information. ERP solutions have built-in controls to ensure data security.

Both on-premises and cloud-based ERP systems offer a higher level of security. The database system on which the ERP software runs also provides centralized backups of critical and sensitive data. Cloud-based ERP systems can offer an additional layer of security. Because all company data is managed through the cloud, many vendors hire 24/7 security experts to ensure that their servers are protected. This makes it much more difficult for hackers to conduct test attacks if they are performed on a private server.

4.8. Improving Teamwork and Work Processes

The ERP platform streamlines collaboration with others by giving employees access to the data they need when they need it. They do this by providing a cross-departmental database where information for each department is routed to one centralized location. This allows for real-time project updates and improved information sharing throughout the company. With an ERP system in place, each employee has on-demand access to the company's entire data set, allowing you to see the big picture. In turn, this gives your employees the tools they need to take precautions, making them feel more valued. The net effect on the business is increased efficiency and reduced operating costs associated with manually tracking data, as well as active employee participation.

4.9. Standardized Business Processes

Most ERP systems are designed in accordance with industry best practices. These time-tested processes bring significant benefits to companies of all sizes. It also allows businesses to standardize their processes and systems, which further increases productivity and efficiency. Another aspect concerns how the software is implemented. The two main deployments are on-premises and cloud. With an on-premises system, physical software must be purchased and installed on all computers and servers in the company. In a cloud-based system, the entire software package is completely remote from the ERP vendor. Cloud ERP software has been gaining momentum in recent years and is predicted to become even more popular.

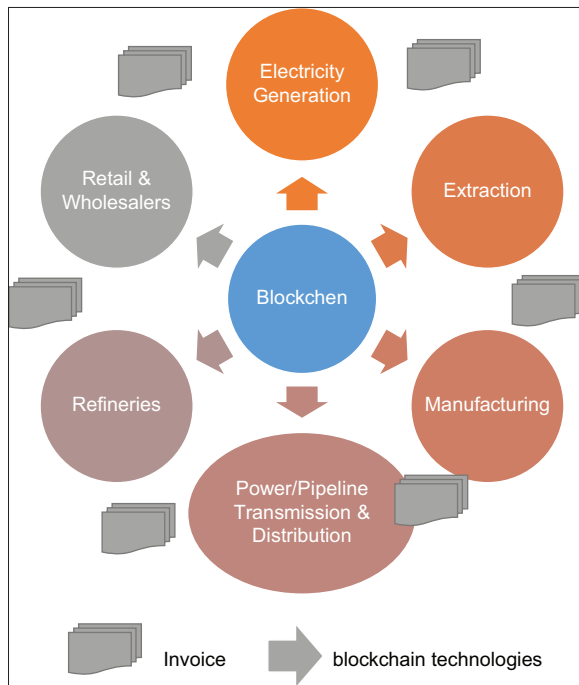
Nevertheless, despite all the advantages, academia has also noted critical challenges in ERP systems Critical Challenges in Enterprise Resource Planning (ERP) Sreekumar A. Menon, Marc Muchnick, Clifford Butler, Tony Pizur. *International Journal of Business and Management*; Vol. 14, No. 7; 2019. RR. 54-69. DOI: 10.5539/ijbm.v14n7p54.

Digital transformation requires continuous improvement of all processes by integrating various functional tasks and technological innovations into a single ecosystem of a modern digital platform. Digital transformation based on the implementation of blockchain technology in the fuel and energy sector is proposed by us in Figure 5.

In accounting, the use of blockchain will increase the transparency of transaction accounting and the financial security of transactional settlements.

ERP systems have become widely used in the management and accounting activities of enterprises due to the possibility of integration on a single platform, which simplifies the interaction of departments (Hossein Motlagh et al., 2020). On a global scale, the experience of the United States, Great Britain, and Canada should be noted.

Studying the world practice according to Sharpen Up the Supply Chain, (2020), it should be noted that in the United States experience with software systems is mostly required: Cognos, SAP, Essbase, Oracle Hyperion, Alteryx and Micro-Strategy Peoplesoft, SQL, Excel, DOMO, Lawson, JD Edwards, QAD, CostPoint, etc.

Figure 5: Digital transformation oil and gas supply chain based on blockchain technology

Source: Developed by authors

Software required for management accountants in Canada includes: AS 400, Cognos, Epicor, MS SSAS, SSRS, MS Power BI, QlikView, Tableau, PMP, PeopleSoft, SAP, Oracle Hyperion, NetSuite, Workday, Microsoft Dynamics, Adaptive Insight.

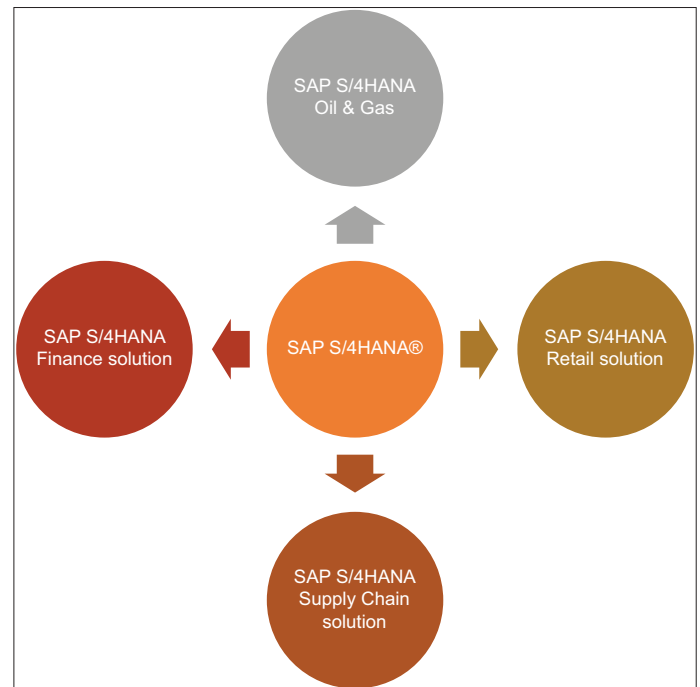
The software experience required in the United Kingdom most often refers to the following systems: Essbase, Cognos, Oracle Hyperion, Anaplan, Spotfire, Microsoft Power BI, Sage, eFinancials, Excel, SAP Hana, Vector, Wims, Capex, Caseware, Lawson, JD Edwards, SAS software.

As we can see SAP is in demand in developed countries, due to the breadth of coverage of industries, product scalability, extended functionality, possibility to get open-source software. SAP offers its products by subscription and is now actively working on cloud platforms.

In the field of digital transformation, working on cloud platforms, SAP offers a number of products SAP Ariba, SAP S/4HANA (OpenText Vendor Invoice Management for SAP Solutions). These products present an opportunity to transform the supply chain and refocus the entire business around the customer. SAP has digitally transformed solutions and technologies to enable companies to run their organizations in real time, improving business outcomes through collaboration, optimized efficiency, and instant analysis.

SAP's new functional platform for the energy market is shown in Figure 6.

Accordingly, Figure 2, from an accounting perspective, considers the SAP S/4HANA Retail solution module, namely the OpenText™ Vendor Invoice Management for SAP® Solutions

Figure 6: New implementation SAP S/4HANA®

Source: developed by the authors according to SAP SE, (2020)

(OpenText™ Vendor Invoice Management for SAP® Solutions) customer relationship management process.

The customer relationship management process involves time-consuming manual entry, thorough communication with the vendor, miscellaneous documentation, requests for additional information from multiple parties, manual routing, and time-consuming monitoring, and unpaid invoice status updates. Instead of using these cumbersome processes, Accounts Payable (AP) employees should have the skills to optimize cash flow and better manage vendor relationships (Heinzelmann, 2019). In addition, retailers need support in complying with key national and international regulations. To ensure timeliness, payment deadlines must be met, and the cost and burden of processing supplier requests must be reduced - producing accurate financial reporting. Open-Source Supplier Invoice Management for SAP solutions helps control invoice processing to streamline these processes and avoid related risks. This application helps AP personnel and suppliers simplify the creation, management, monitoring, and routing of purchase orders and invoices.

Open Text, (2010) reveals the objectives of this product:

- Streamline accounts payable processes by improving invoice status visibility;
- Reduce manual and inefficient paper-based billing processes;
- Automate data entry using OCR (optical character recognition);
- Improving vendor relationships through timely payments and fewer status inquiries;
- Ensure accurate and timely reporting to internal and external organizations.

OpenText VIM Solutions optimizes the billing process:

- To receive invoices by the personnel in the warehouse;
- For entering the service letter;

- For customer purchases;
- For accounts payable;
- For payment tracking.

VIM reduces the time it takes to process invoices by quickly collecting invoice data and automatically routing invoices based on business rules. An integrated self-service interface for vendors and employees reduces response time to invoice and payment status inquiries. OpenText VIM Solutions (ICC) fully integrates invoicing and data entry into the process. Reducing AP billing cycle time and eliminating late payment penalties can result in significant savings, improved supplier relationships, and greater supplier discounts. Enabling invoice processing in a timely manner allows the purchasing department to negotiate additional discounts for early payment.

The ability to manage the invoicing process from metadata ingestion to prompt postings allows VIM to move from a simple robotic solution to an intelligent robotic solution.

When integrated with existing enterprise applications such as SAP Supplier Relationship Management (SRM), SAP Shared Service Framework Finance, or the SAP Ariba network, VIM provides the foundation for secure and scalable growth. Companies can grow their business by providing a high level of service to internal and external AP professionals, employees, and suppliers. SAP systems are used to support high volumes without adding additional resources (Petratos and Faccia, 2021). Created for SAP S/4HANA, VIM complements the new simplified concepts found in S/4HANA with world-class account automation. Users can run complex transactional processes only in the modern SAP Fiori interface. The ability to handle transactional and analytical tasks in the same environment provides real-time dashboards that show the root causes of excessive costs and overdue payments. Process details and corrective actions are directly shown in the displayed data.

Relevant and optimized VIM invoice transactions go through a defined and documented set of business procedures. The actions a user can take to resolve a problem are linked to specific user roles. This ensures a strict segregation of duties. Auditors have full access to this detailed processing history at all times because all steps taken are documented in the audit trail. These functions are prerequisites for fraud prevention and internal control over financial reporting rules, as in Section 404 of the Sarbanes-Oxley Act in the United Kingdom.

This level of compliance reduces the risk of maintaining efficiency: the same data is used for detailed reporting, allowing for quick analysis of processing bottlenecks, such as excessive downtime, the number of clicks, or the time required to process account issues. Trend analytics can identify vendors billing incompletely or inaccurately. Integrated trend visualization proves process efficiency and promotes continuous process optimization.

The solution also helps to automatically classify problem invoices as blocked, processed, or in process. The classification identifies the different stages of the processing cycle, while messages are sent out about the different levels of invoice status.

Depending on the classification, exceptions for invoices are routed according to established business rules and policies. The workflow configuration determines where invoices go and what permissions or next steps to take. The reconciliation process needs to notify suppliers of payment exceptions to expedite resolution.

Deloitte (2017c), a consulting agency, is helping to develop SAP products. Deloitte's pre-built DESC solution on the SAP platform reduces errors - with a potential 15% reduction in overall maintenance costs - through predictive analytics and modeling capabilities that help transform supply chains. A more intuitive user interface supports real-time decision-making based on item-level granularity rather than aggregated data. Increased transaction speed is achieved by including an exception table in SAP S/4HANA that blocks and dramatically reduces transaction processing time. Real-time inventory capabilities can help reduce inventory costs by 12%. Optimized processes and predictive analytics help reduce lead times by 10%.

Deloitte experts, (2017b) note that SAP:

- Increases value for partners by implementing advanced supply chain technology and accelerating solution planning;
- Improves customer service through better supply and demand planning;
- Helps identify supply issues quickly by identifying bottlenecks and responding to them in real time;
- Provides the best service from suppliers through increased collaboration;
- Helps gain a better understanding of costs and options by controlling lead times.

Oroc, (2017) describes SAP Invoice Management from OpenText (VIM) in detail in his paper. SAP Invoice Management by OpenText (VIM) is a comprehensive solution that automates the invoice flow. It is designed for large enterprises and general service centers in corporate groups, where the number of financial documents handled reaches tens of thousands per month. Integration of the best SAP tools and solutions from OpenText is a guarantee of comprehensive and transparent invoice flow - from recording to sending and archiving. Key benefits include faster payment processing and lower operating costs.

As a result of the strategic partnership agreement between SAP and the largest EIM (Enterprise Information Management) solutions provider, the Canadian company OpenText, the SAP offering was expanded to include tools that complement the transactional ERP system with enterprise information management solutions (Yi et al., 2021).

The certified and fully integrated SAP application supports incoming invoice channels ranging from a fax, scanning, EDI, and PI/XI to electronic filing (email) and self-service systems such as SAP SRM.

Implemented matrices for exception handling management help eliminate 99% of incoming invoice processing issues with or without a purchase order reference.

The system is designed to accept an invoice, and have it automatically reassigned if no exception is found in the processing step. At this stage, its analysis starts according to the configuration created based on the business processes of the company by experienced SAP consultants. The solution can be integrated with SAP-certified document archiving tools, as well as with the most popular OCR tools and tools for data extraction from scanned documents and PDFs.

Based on SNP's implementation experience done for clients, the author recommends the following set of OpenText tools: SAP Document Access (ADA - document archive) and SAP Business Capture Center (SNP - OCR data extraction platform). In dedicated transactions, SAP Invoice Management by OpenText can run on off-the-shelf (customizable) screens in SAP GUI, SAP Fiori, and/or SAP Portal.

SAP Invoice Management by OpenText is a solution designed for large companies that focus on their core business and are interested in reducing their financial processing time to the required minimum. It is also suitable for general service centers operating in corporate groups. It can be used for efficient invoice settlement - SAP MM/SRM functionality provides full automation of invoice processing.

Its main functions in the billing process include:

- Accounting of financial documents,
- Document recording in the process,
- Automatic execution of documents with a purchase order.

Moreover, the solution supports up to 88 defined exceptions for invoice processing with and without a purchase order. Prepared reporting tools provide access to a complete set of financial reports generated from the data recorded in the system. In addition, there is a rich set of analytical reports on processing processes and KPIs (additional value for SSC Shared Service Centers).

Extensive document archive management options allow, for example, the definition of a retention period for documents within a legal period (a document will be automatically deleted after a certain period of time). The solution supports invoice acceptance in SAP GUI, SAP Portal, and SAP Fiori.

SAP VIM uses the SAP HANA platform to support system processes and reports, which has a positive impact on processing time and efficiency. Process simplification, especially in the area of vendor services, has been achieved by incorporating the SAP Ariba platform into the solution.

The solutions used allow full auditing of system activities and thus guarantee transparency of the process from order to payment.

The establishment and enforcement of financial document flow rules (workflow, escalation, substitutions, response times, etc.) required by the system configuration contributes to process transparency and helps gain full control over the flow of financial documents in the company. The analytics provided on the most common bottlenecks help identify the most time-consuming

accounts in the process. Reorganizing the flow and approval of financial documents promotes more efficient use of valuable accounting resources (freeing them from the time-consuming task of entering document content into the system manually) and eliminates payment bottlenecks caused by delayed document posting. Improved collaboration between the financial accounting department and the purchasing department, as well as with suppliers, is just as important to a company's efficiency.

Deloitte OpenText Vendor Invoice Management (VIM) works with SAP ERP to streamline accounts payable (AP) operations. VIM streamlines and simplifies the process of receiving, managing, and controlling accounts payable and vendor invoices. Most companies strive for a "no touch" process, where invoices go directly from checking to posting. However, one of the challenges of automation is assigning a tax code because it cannot be taken from the invoice. Deloitte's available automatic tax code assignment for invoice solutions gives:

- Significantly reduce the time to find the correct tax codes;
- Automate the determination of the tax code by working through possible scenarios;
- Assigning a tax code to all invoice items with minimal human intervention.

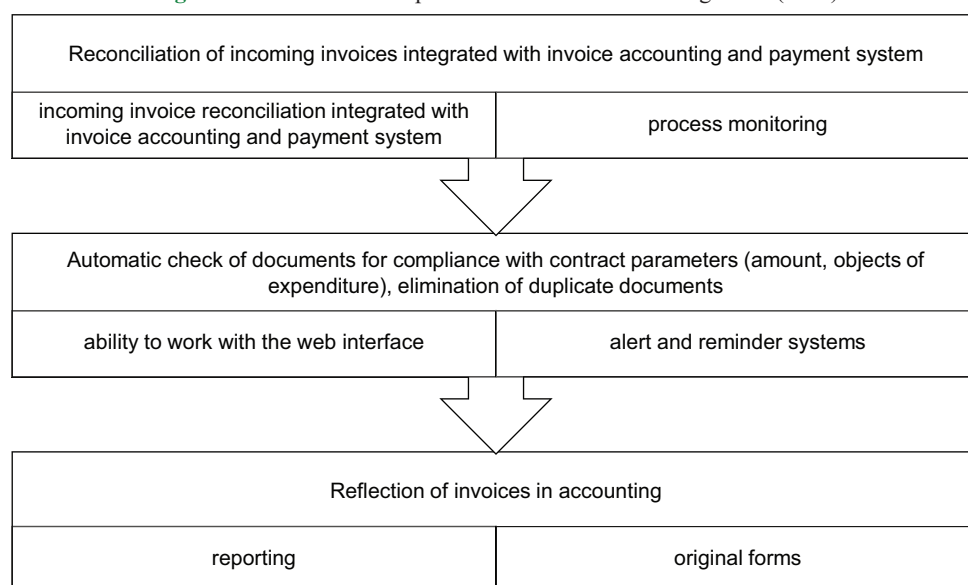
The software product helps in creating the necessary control over indirect tax:

- Control that the account complies with the law and allows invoices to be sent depending on the established business rules for the relevant user or group of users.
- Taking all the necessary elements of providing a tax code to all items.

Leveraging the full potential of VIM capabilities, Deloitte combined its tax expertise with the technological skills of OpenText and developed logic to incorporate indirect tax controls into AP.

Based on a combination of supplier invoice data from the scanning process, master data, and transaction data, the proposed logic will direct the invoice to the exception stream when certain legal requirements are not met. Some EU countries require that the company's VAT payer number be listed on the supplier's invoice for VAT deduction. In cases where the supplier has not indicated a VAT payer number or has not mentioned the correct VAT payer number of the recipient company on the invoice, VIM will automatically send the invoice to the appropriate person. New and customized checks can be created as needed to meet all business and tax requirements.

Automatic tax code determination for invoices, Deloitte's solution aims to assign the correct tax code to each individual purchase and non-purchase invoice item in a similar manner using master and purchase order data (for purchase invoices) in a different existing logic. An additional advantage of the Deloitte logic over the traditional tax code definition available in SAP is that the invoice data is also used in the definition logic. This means that data known only at the time of receipt of the invoice is also taken into account, such as the actual location where the supplier makes the delivery.

Figure 7: Process model OpenText vendor invoice management (VIM)

Source: Developed by the authors based on OpenText data, (2015)

Deloitte logic has a standard set of data elements considered in the determination process, such as: invoice form, invoice to, shipment, dispatch, material, incoterms, etc.). This data set can be limited or expanded with other elements depending on the needs of the company. To support companies from a global perspective, Deloitte implies integration with tax systems such as Vertex, ONESOURCE.

The main advantages lie in the standard SAP tax code assignment capabilities, for example by manually entering the tax code on creation and/or on receipt of invoice, or by using table conditions to determine the tax code when creating a purchase order. The difficulties with these approaches are varied: it negatively impacts the purchasing department, integration can be difficult, and the data may be available and/or accurate.

The main advantage of the “Automatic Tax Code Determination for Invoices” solution is that the tax code is determined at the time of invoice processing when all the information is available. This not only reduces the risks associated with inappropriate invoices that can result in the rejection of incoming VAT but also increases the accuracy and speed of tax coding, ensuring that invoices are reported in a timely and correct manner. Another advantage is that the solution can be implemented in existing VIM environments. The logic is triggered as soon as invoices are entered. OpenText vendor invoice management and exception handling. This allows if not all of the required information is captured on the OCR to manually enter the missing parameter and restart the logic within the Invoice Cockpit.

The logic gets the different tax code definition data elements, which are the input parameters to the tax condition table. By combining all the different data elements, it looks for the tax code from the tax condition table and finally provides the tax code to each line of invoices.

Deloitte not only provides a tool to automate the definition of the tax code, but it also provides a solution that allows or prevents

the end user from overwriting the value determined by the logic. If an end user overwrites a value, Deloitte’s solution tracks it by providing an audit trail, such as which user made the change and when. Also, if the definition fails when you enter an invoice, the logic tells you which parameter is missing so that you can terminate it and restart the logic inside the Invoice Cockpit.

OpenText, (2015) describes the OpenText Vendor Invoice Management (VIM) software product to allow its integration with the SAP ERP invoice accounting and payment system.

The OpenText Vendor Invoice Management (VIM) process model is displayed in Figure 7.

As a result of the implementation of the process model shown in Figure 7 of the process model, we can obtain:

- A. Creation of a unified document storage base.
- B. Reduction of document approval time from 20-30 days to 5-10 days.
- C. Prompt reflection of expenses in accounting.
- D. Reduction of temporary differences in expenses between accounting and reporting of production units.

Implementation of OpenText Vendor Invoice Management provides the company with an effective tool for managing the process of approval of incoming documents and reducing the risk of delays in accounting under conditions of territorial remoteness of subdivisions, as well as correct determination of the tax code.

5. ACKNOWLEDGMENT

This work was supported by the Ministry of Education and Science of Ukraine (0122U000774 «Digitalization and transparency of public, corporate and personal finance: the impact on innovation development and national security»).

6. CONCLUSION

The study proved that the fuel and energy sector accounts for about 5% of global trade by imports and is the base industry for all other manufacturing sectors and transport. Integration with different industries requires the introduction of modern digital technologies. Digital transformation is the process of creating ecosystems developed with the help of modern information and communication technologies. Integration is carried out based on all kinds of Enterprise Resource Planning systems. Digital transformation allows to improve accounting operations and bank calculations. The logic of accounting coincides with supply chains, and the proposed implementation of blockchain technology will improve the quality and speed of banking transactions, productivity, and employee competencies.

REFERENCES

- Ahmad, T., Zhang, D., Huang, C., Zhang, H., Dai, N., Song, Y., Chen, H. (2021), Artificial intelligence in sustainable energy industry: Status Quo, challenges and opportunities. *Journal of Cleaner Production*, 289, 125834.
- Amanova, G.D., Akimova, B.Z., Zhumabekova, G.Z., Zholayeva, M.A., Urazbayeva, Z.O. (2020), Reserves in agro-industrial complex during integration of energy conservation processes and transition to the concept of energy-conserving production. *Industrial Engineering and Management Systems*, 19(1), 14-25.
- APQC. (2015). The Skills Gap in Entry-level Management Accounting and Finance. Houston: APQC. Available from: <https://www.imanet.org/media/11e94af9ea7a40498ee78184fe9caf93.ashx?la=en>
- Barna, L.E.L., Ionescu, B.Ş., Ionescu-Feleagă, L. (2021), The relationship between the implementation of ERP systems and the financial and non-financial reporting of organizations. *Sustainability*, 13(21), 11566.
- Deloitte. (2015), Tax Benefits of Using SAP. OpenText Vendor Invoice Management Simple, Time Efficient and Green.
- Deloitte. (2017b), Where the Supply Chain and Business Planning Meet. What it takes to Deliver End to End Enterprise Value. London: Deloitte. p6.
- Deloitte. (2017c), Deloitte Exponential Supply Chain (DESC) Powered by SAP S/4HANA® A Configure Approach to Help you Realize Value Sooner. London: Deloitte. p9.
- Deloitte. (2017a), When Two Chains Combine. Supply Chain Meets Blockchain. London: Deloitte. Available from: <https://www2.deloitte.com/content/dam/deloitte/us/documents/strategy/us-cons-supply-chain-meets-blockchain.pdf>
- Drake, W.J., Cerf, V.G., Kleinwächter, W. (2016), Internet Fragmentation: An Overview. Future of the Internet Initiative White Paper, World Economic Forum, Geneva. Available from: https://www3.weforum.org/docs/WEF_FII_internet_fragmentation_an_overview_2016.pdf
- Duch-Brown, N., Rossetti, F. (2020), Digital platforms across the European regional energy markets. *Energy Policy*, 144, 111612.
- Goh, T., Ang, B.W. (2019), Comprehensive economy-wide energy efficiency and emissions accounting systems for tracking national progress. *Energy Efficiency*, 12(8), 1951-1971.
- Gopal, S., Pitts, J., Li, Z., Gallagher, K., Baldwin, J., Kring, W. (2018), Fueling global energy finance: The emergence of China in global energy investment. *Energies*, 11(10), 2804.
- IEA. (2021), World Energy Outlook. Paris: International Energy Agency.
- Lyu, W., Liu, J. (2021), Artificial Intelligence and emerging digital technologies in the energy sector. *Applied Energy*, 303, 117615.
- Mihai, F., Aleca, O.E., Stanciu, A., Gheorghe, M., Stan, M. (2022), Digitalization-the engine of sustainability in the energy industry. *Energies*, 15(6), 2164.
- SAP Business Suite Powered by SAP HANA. (2019), Fact Book. Find Out How SAP Business Suite Powered by SAP HANA Delivers Business Value in Real Time.
- SAP. (2019), Simplification List SAP S/4HANA 1909 Initial Shipment Stack. Document Version: 1.13-2019-09-12. Germany: SAP. p1032.
- SAP. (2020), Refocus your Grow Strategy with a Customer-centered Supply Chain Powered by SAP Solutions. Sharpen up the Supply Chain, Accenture, Consulting. p23.
- Simplification List SAP S/4HANA 1909 Initial Shipment Stack. (2019), Document Version: 1.13-2019-09-12. p1032.
- Tiutiunyk, I.V., Lieonov, S.V., Vysochyna, A.V. (2020), The Innovative Financial Technologies and its Impact on Shadow Transactions (Doctoral Dissertation, Sumy State University).