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INDUSTRIAL MANAGEMENT FEATURES IN THE CONTEXT OF ABB ABILITY SYSTEMS APPLICATION

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Annotation. ***The goal of the article*** *is to identify the specific characteristics of industrial management in the context of utilizing ABB Ability systems.* ***Methodology of research***. *The achievement of the goal set in the article was accomplished through the following research methods: logical generalization and scientific abstraction, structural analysis, analytical method, and systemic analysis.* ***Findings***. *Defined and characterized specificity of changes in the industrial management format due to the application of ABB Ability has been identified and described. It has been determined that the utilization of ABB Ability systems leads to quite specific alterations in the structure of industrial management, production planning systems, support systems for operational equipment and manufacturing processes, monitoring systems, continuous improvement systems, and energy consumption efficiency support systems.* ***Practical value.*** *The research results have identified specific changes in the industrial management format influenced by ABB Ability. These changes pertain to various aspects of enterprise management and its manufacturing processes. Further research directions could encompass the study of ABB Ability's impact on organizational culture and an analysis of the effectiveness of ABB Ability implementation.*

Keywords: *cost analytics, supply chain management, production systems, sensors, equipment, planning.*

Statement of the problem in general and its connection with important scientific or practical tasks. The foundation of the scientific issue addressed by the outlined research is being formed by the unique characteristics of management that arise during the practical implementation of ABB Ability (or the latest platform of digital solutions from the eponymous Swedish-Swiss international corporation specializing in electro-technical products, robotics, automation, and energy system management – Asea Brown Boveri (or ABB]). In doing so, the field of research was shaped by the fact that the outlined platform effectively led to the emergence of a new concept of digital solutions and services (which Asea Brown Boveri actively developed since 2017). Initially, this concept existed merely as a general idea for enhancing the internal operations of the ABB corporation. Since its inception, the ABB corporation has, within the framework of this concept, focused on implementing unique digital technologies, data analytics, and other software solutions to optimize its industrial processes and enable more effective production management. However, aiming to expand its operations, ABB began offering ABB Ability solutions to other enterprises in various industries, including industrial sectors, assisting in process optimization and enhanced efficiency. In such circumstances, the overarching concept of ABB Ability quickly evolved. During the initial stages of ABB Ability system implementation, its significant impact on various aspects of industrial management became evident. This included its connection to practical tasks such as production rescheduling, quality management, support for unique equipment operation, energy consumption efficiency, and many others.

Analysis of recent research and publications. Various issues of industrial management are being explored by plenty of researchers, including individuals such as Zakharov V.A., Neurov I.V., and Safronova K.O.. However, many of these authors tend to study classical industrial management systems, often without considering the contemporary changes that have been introduced in the field due to the implementation of new concepts, technologies, and systems like "smart factories".

Indeed, there is currently a lack of publications that analyze industrial management in the context of using ABB Ability (which is one of the analogs of "smart factory" systems) or similar systems, as they are relatively new in the market (being implemented and developed over a few years). This novelty initially limited the scope of research, as time was needed for enough data and practical experience to accumulate for systematic scientific analysis. At present, all conditions are in place to make such research possible.

Formation of the purposes of the article (statement of the task). The goal of the article is to identify the specific characteristics of industrial management in the context of utilizing ABB Ability systems.

Presentation of the main research material with the full justification of the scientific results obtained. Within the scope of the research, we are considering ABB Ability not only as a comprehensive set of digital technologies, services, and solutions provided by ABB but also as a system that, through its focus on efficiency enhancement, production process optimization, and management support

across various industrial sectors, is reshaping the format of enterprise industrial management. While the Asea Brown Boveri corporation does not disclose the names of the enterprises where their technology is applied due to commercial restrictions and client data confidentiality, they do indicate that as of 2023, ABB Ability has more than 63,000 users, with the number continuing to grow [5]. Furthermore, Asea Brown Boveri points out that based on the experience of applying ABB Ability in various manufacturing sectors such as metallurgy, chemical industry, automotive industry, and many others (Table 1), it can be concluded that this specific impact is driven by the system's utilization of modern technologies, including data collection and analysis, artificial intelligence, augmented reality, and other innovative approaches to provide users and enterprises with tools for improved management and decision-making.

These are just a few examples of industries where ABB Ability can be applied. However, based on the provided examples, it's evident that ABB Ability provides the capability to [5]:

1. Collect data from equipment, sensors, and systems.
2. Analyze data to identify patterns, trends, and anomalies.
3. Implement predictive maintenance for equipment and production processes.
4. Optimize manufacturing processes and reduce costs.
5. Improve product quality and quality management.
6. Enhance energy efficiency and implement sustainability.
7. Enable monitoring and control through mobile devices and remote platforms.

The technical solutions of this system are adapted to the specific requirements and needs of each enterprise, helping achieve greater efficiency, cost reduction, and improved product quality.

The components of ABB Ability can include the following elements (Figure 1):

– ABB Ability™ Operations Data Management (a module that enables the collection, aggregation, and analysis of data from various sources, such as sensors, equipment, and other systems).

– ABB Ability™ Asset Health Center (a module that employs analytics and machine learning to monitor equipment condition and predict potential failures).

– ABB Ability™ Collaborative Operations (a module that facilitates collaboration between different teams and departments, harnessing knowledge and aiding in solving complex problems through collective expertise).

Table 1

Analysis of the experience of using ABB Ability in various manufacturing sectors

Manufacturing sectors	Directions of ABB Ability application	The impact of ABB Ability on the format of industrial enterprise management
Metallurgy	In metallurgy, ABB Ability can be employed for monitoring and controlling temperatures, measuring chemical composition, analyzing alloying and impurity processes, as well as enhancing the production processes of rolling and casting operations.	The implementation of ABB Ability enables more precise process control, reduces deviations in production parameters, enhances the quality of produced steel, lowers costs, and increases productivity
Chemical Industry	In the chemical industry, ABB Ability can be utilized for automating reaction processes, precise control of chemical reactions, monitoring pollutants and emissions, as well as optimizing raw material and energy consumption.	The application of ABB Ability in the chemical industry aids in achieving greater precision in manufacturing processes, ensuring adherence to quality and safety standards, and enhancing the efficiency of resource utilization.
Pharmaceuticals	In the pharmaceutical industry, ABB Ability can be applied for various purposes aimed at optimizing and improving the production processes of medicinal products and pharmaceutical items.	The utilization of ABB Ability enables the automation of various stages in pharmaceutical manufacturing, ranging from measuring and mixing components to packaging the final products.
Automotive Industry	In automotive manufacturing, ABB Ability can be used for monitoring and controlling manufacturing component parameters, automating assembly processes, tracking quality, as well as implementing consistency and waste reduction.	The implementation of ABB Ability allows for improved production efficiency, reduced costs related to defective products, accelerated assembly and manufacturing processes, as well as enhanced resource management.
Energy Sector	In the energy sector, ABB Ability can be utilized for monitoring, managing, and optimizing power plant operations, introducing energy-efficient technologies, improving energy distribution, as well as integrating renewable energy sources such as wind and solar power.	The application of ABB Ability in the energy sector helps to enhance the efficiency of power plant operations, reduce energy losses, increase supply reliability, and respond more swiftly to changes in demand and market conditions.

Source: formed based on Asea Brown Boveri data [5]

– ABB Ability™ Predictive Maintenance (a module based on data analysis and machine learning to predict equipment failures and prevent them using pre-developed maintenance plans).

– ABB Ability™ Smart Sensors (a module that transforms regular equipment into "smart" devices using sensors that gather data about their condition and functioning).

– ABB Ability™ Manufacturing Operations Management (a module focused on managing manufacturing processes, including planning, quality control, production tracking, and more).

– ABB Ability™ Remote Insights (a module that enables remote monitoring and control of equipment and processes, helping avoid costly on-site visits).

Each module is flexible and can be customized and integrated based on the specific needs of the individual enterprise. Despite such flexibility, the ABB Ability system application in industrial management introduces several challenges in organization and production management (Figure 2).

Using the method of generalization to the negative aspects of organization and management of production processes when implementing the ABB Ability system, the following can be attributed:

– Digital transformation (or converting traditional production processes into a digital format).

– Utilization of big data (processing large volumes of data, establishing powerful computational resources, and accessing specialized software).

– Reliance on analytics and forecasting tools (creating quality data and accurate analysis that can lead to precise or accurate forecasts [4–5]).

– Systemic automation and optimization (utilizing technologies, software, and equipment for the automatic execution of production tasks that previously required human intervention).

– Real-time monitoring and response (tracking events, data, or information in real time and responding immediately).

– Continuous improvement (ongoing assessment and analysis of areas for enhancement, implementing changes to achieve better results, efficiency, and quality).

The outlined features alter the specific characteristics of industrial management according to the following specifics:

1. The implementation of ABB Ability requires a transition to digital technologies and processes. Industrial management must be prepared for digital transformation, adopting new systems, training the workforce, and adapting to new working methods, according to the following specifics:

– Leaders must prioritize digital transformation and create a motivational environment for the adoption of new technologies.

– The workforce needs to be ready to work with new digital tools (management should establish training systems, workshops, and support mechanisms to ensure that employees understand how to work with ABB Ability and utilize it for the benefit of the enterprise).

– Managers must be ready to review and adapt processes to align with new digital capabilities.

– Managers need to ensure proper protection against potential cyber threats and vulnerabilities.

– Managers should be prepared to analyze effectiveness and implement necessary changes/

Such an approach from the production management ensures the successful implementation of the ABB Ability system, particularly achieving positive outcomes from its application.

2. The ABB Ability implementation generates vast amounts of data about equipment performance, collected from sensors and process controllers. There are several fundamental steps that industrial management can consider:

– Defining specific goals for data collection and analysis, particularly aspects of the production processes that can be improved through analytics,

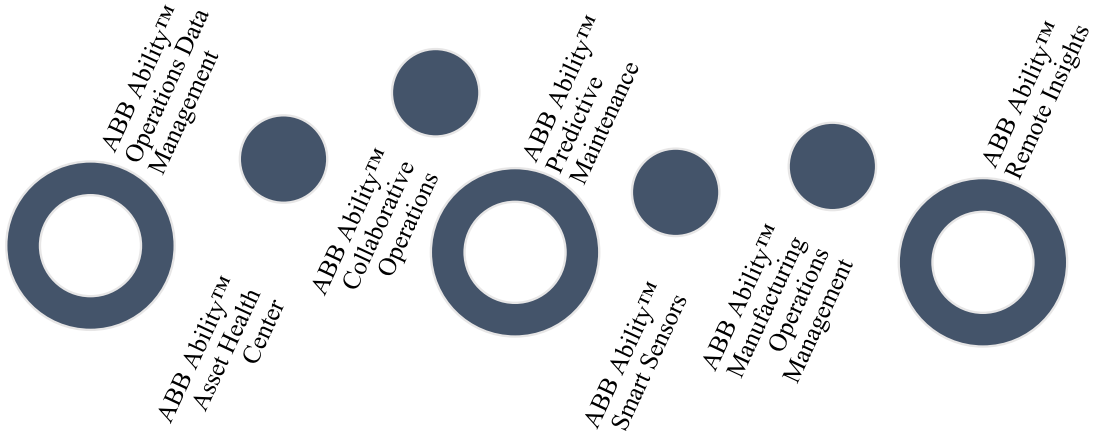

Figure 1. The components (or basic elements) of ABB Ability system

Source: formed based on Asea Brown Boveri data [5]

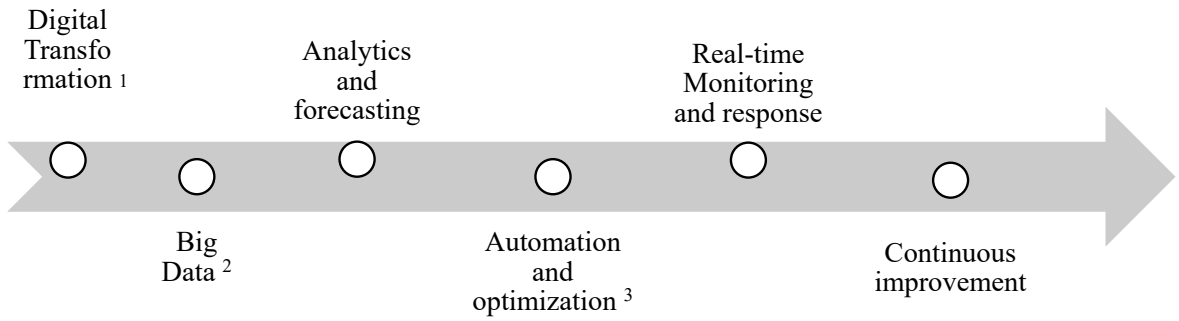

Figure 2. Aspects of organization and production management processes in case the ABB Ability system using

Note

1. The production system is reorienting towards advanced digital technologies and practices to optimize its operations.

2. The production system is reorienting towards an adequate infrastructure for processing and storing large volumes of data.

3. The production system is reorienting towards finding the most efficient and optimal ways of task execution to achieve better results.

Source: formed based on [1–2; 5]

and the expected outcomes (such as reducing failures, increasing efficiency, lowering costs, etc. [2–3]).

– The need to select appropriate sensors and process controllers for equipment (these sensors and controllers should be compatible with the ABB Ability system and capable of providing quality data to the equipment support [5]).

– Establishing a system that reads and accumulates data from equipment sensors and production lines (it should facilitate connecting sensors to the Internet of Things (IoT), processing, and transmitting data to a central database [5–6]).

– Choosing platforms for storing large volumes of data (these could be cloud platforms or proprietary servers [7]). It's crucial to platform selection that ensures fast access and reliable data storage.

By analyzing real-time data from equipment sensors and controllers and utilizing forecasting through ABB Ability modules, real-time management obtains an accurate snapshot of the state of production processes. It aids in promptly responding to any changes and deviations in production processes, ensuring more precise planning. As a result, through the outlined steps combination, management establishes a mechanism that elucidates how to effectively collect, store, and analyze large data sets and formulate flexible and precise production planning systems. These systems minimize costs and enhance the overall productivity of the enterprise's manufacturing system. Possible changes in production planning systems through ABB Ability are shown in Figure 3.

Data analysis enables the formation of energy consumption efficiency support systems through ABB Ability, which can monitor and analyze energy consumption in real time. It allows for opportunities to reduce costs and optimize energy efficiency identification.

3. The ABB Ability utilization enables the automation of production processes and their optimization through data analysis. In particular:

– Allows for configuring automatic scenarios and responses to various situations. For instance, the system can be set to automatically shut down equipment upon detecting abnormal parameters indicating potential malfunction.

– Enables the tracking of equipment operation and production processes in real time. For example, it empowers operators and systems to automatically respond to any changes, even minor ones, and determine optimal operating modes for equipment (based on collected data, the optimal operating mode can be established to achieve the highest productivity with minimal costs [2; 5]).

– Enables predicting potential equipment failures based on historical data. This facilitates planning for maintenance before significant issues arise.

Through a set of outlined characteristics, management can establish production process support systems that, notably in real-time, configure the utilization of automated solutions to achieve high productivity and low costs/

4. The ABB Ability application enables real-time process monitoring and facilitates swift decision-making based on reliable data. In this context, the main changes occurring within the outlined scope can be categorized into the following directions:

– Establishing clear procedures and roles for operational response. This helps ensure organization, efficiency, and coordination when addressing potential issues and situations.

– Identifying parameters critical to production processes to focus attention on aspects that have the most significant impact on efficiency and seamless operation. It aids in enhancing production quality and avoiding unknown risks.

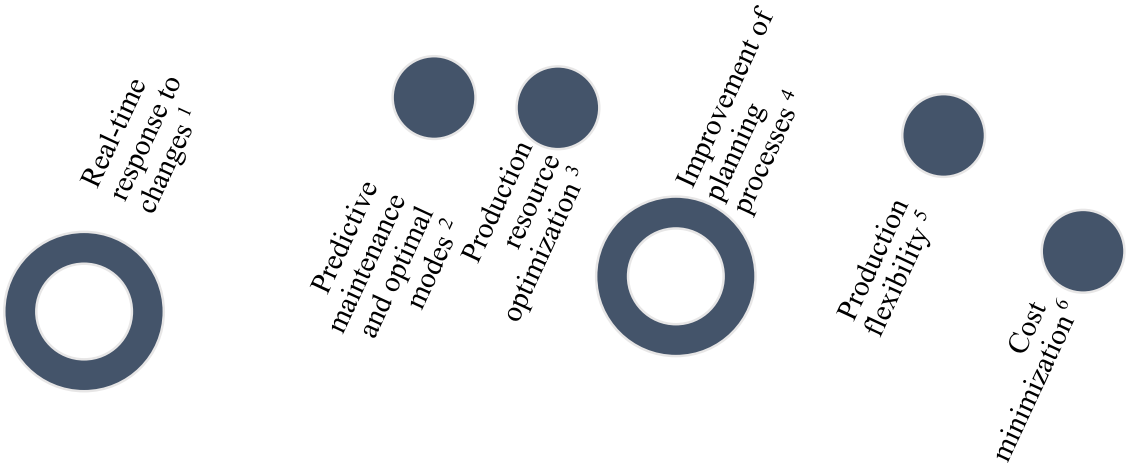

Figure 3. Possible changes in production planning systems through ABB Ability.

Note

1. The system can react promptly to any deviations in the production processes. Even minor changes can be detected and considered, helping to avoid potential issues.

2. The system can provide the ability to predict possible failures and establish optimal operating modes. This helps prevent uncontrolled stops, reduce the risks of accidents, and ensure stable operation.

3 The system assists in finding an optimal balance between resource consumption, productivity, and production cost. This allows for a more efficient utilization of materials, energy, and workforce.

4. The system proposes optimal production scenarios and resource planning. This helps avoid inefficient use of equipment and reduces unnecessary expenses.

5. System changes can be implemented quickly and flexibly through forecasting and adaptation to new conditions.

6. The system can introduce changes to production processes aimed at cost reduction and production optimization.

Source: formed based on [2; 5]

– Planning response scenarios for different situations enables operators and personnel to react quickly and thoughtfully. It also involves the ability to anticipate potential consequences of actions and choose the most appropriate course of action.

Through a set of the outlined characteristics, industrial management establishes real-time monitoring systems that minimize deviations from quality standards and enhance responses to them. Such a system aids in increasing the accuracy of production processes, reducing their duration, and improving the efficiency of manufacturing operations.

5. Using ABB Ability, management can continually enhance processes based on data analysis and pattern recognition. It becomes achievable through:

– Identifying areas for improving production processes. These can encompass realms such as reducing failures, increasing productivity, lowering costs, and improving quality.

– Defining areas for result monitoring and evaluating their effectiveness. It aids in determining whether set goals have been achieved and how monitoring processes can be further refined.

– Establishing cyclical processes of data collection, analysis, implementation of improvements, monitoring, and updating. It permits the constant adaptation of approaches and the achievement of optimal results.

– The formation of continuous improvement systems by management provides opportunities for one-time and batch optimization of production processes. With ABB Ability system, it allows:

– Conducting detailed data analysis to identify deviations and find improvement opportunities at a specific moment. In management, this enables timely responses to changes, even if they require short-term adjustments or process modifications. It aids in swiftly addressing issues and minimizing deviations.

Conducting deeper batch optimization. It implies that data analysis and forecasting using management can identify systemic patterns and periodic variations. Batch optimization involves thorough analysis and reconsideration of elements within the production process to achieve more significant and long-lasting improvements.

Conclusions from the mentioned problems and prospects of further research in the given direction. The research results highlight the specificity of changes in the industrial management format due to the implementation of ABB Ability. This process leads to the following changes in its structure:

1. Formation of flexible and precise production planning systems that minimize costs and enhance the overall productivity of the enterprise's manufacturing system. Potential changes in production planning systems through ABB Ability involve gaining capabilities to react to real-time changes, predict failures and optimal modes; optimize production

resources, improve planning processes; and promote production flexibility and cost minimization.

2. Creation of support systems for the operation of production equipment and processes, aiding in timely issue detection and ensuring proper technical support for equipment operation. It involves configuring the utilization of automated solutions to achieve high productivity and low costs.

3. Establishment of real-time monitoring systems that minimize deviations from quality standards and enhance responses to them. This system contributes to increased accuracy of production processes, reduced process duration, and improved efficiency of manufacturing operations.

4. The formation of continuous improvement systems by management provides opportunities for one-time and batch optimization of production processes.

5. The establishment of energy consumption efficiency support systems generates capabilities for real-time monitoring and analysis of energy consumption. This enables the identification of opportunities to reduce costs and optimize energy efficiency.

Including consideration, the practical implementation of the highlighted changes in the format and fundamental characteristics of industrial management driven by ABB Ability, it will allow us to examine how this process impacts the organizational culture, its innovation capacity, and adaptability. Additionally, it will enable us to analyze the overall effectiveness of ABB Ability implementation. It is crucial to determine the extent to which successfully implemented changes are reflected in key performance indicators of the enterprise, such as cost reduction, productivity enhancement, and product quality improvement.

REFERENCES

1. Bannikov V., Lobunets T., Buriak I., Maslyhan O., Shevchuk L. (2022) On the Question of the Role of Project Management in the Digital Transformation of Small and Medium-Sized Businesses: Essence and Innovative Potential. *Amazonia Investig*, vol. 11, pp. 334–343. [in Colombia]

2. Zhmay O. V., Moz·hal′ova M. Yu. (2022) "Rozumni fabryky": peredumovy vynyknennya ta perspektyvy rozvytku, ["Smart factories": prerequisites for the emergence and prospects of development]. *Rynkova ekonomika: suchasna teoriya i praktyka upravlnnya*, no. 21, vol. 1 (50), pp. 79–96.

3. Zakharov V. A. (2017) Analiz suchasnoho stanu operatsiynoho menedzhmentu na zakordonnykh promyslovykh pidpryyemstvakh [Analysis of the current state of operational management at foreign industrial enterprises]. *Molodyy vchenyy,* vol. 1, pp. 75–82.

4. Halkiv L., Karyy O., Kulyniak I., Ohinok S. (2020). Innovative, Scientific and Technical Activities in Ukraine: Modern Trends and Forecasts. 2020 *IEEE Third International Conference on Data Stream Mining & Processing (DSMP),* pp. 321–324 [in Ukrainian].

5. Official Website Asea Brown Boveri. Available at: https://abb.com (accessed May 18, 2023) [In Sweden]

6. Voronkovoyi V. H., Metelenko N. H. (2020). Promyslovyy menedzhment: teoriya i praktyka [Industrial management: theory and practice]. Zaporizhzhia: Vyd-vo: INNI ZNU, 338p. [in Ukrainian].

7. Yashchyshyna I.V. (2018). Sut′ ta osoblyvosti smart-pidpryyemstv [Scientific notes of the National University Ostroh Academy. "Economy"]. *Naukovi zapysky Natsional'noho universytetu «Ekonomika*», no. 39, vol. 11, pp. 14–18

СПИСОК ВИКОРИСТАНИХ ДЖЕРЕЛ

1. Bannikov V., Lobunets T., Buriak I., Maslyhan O., Shevchuk L. On the Question of the Role of Project Management in the Digital Transformation of Small and Medium-Sized Businesses: Essence and Innovative Potential. *Amazonia Investiga*, 2022. Vol. 11. P. 334–343.

2. Жмай О. В. Мозгальова М. Ю. "Розумні фабрики": передумови виникнення та перспективи розвитку. *Ринкова економіка: сучасна теорія і практика управління*. 2022. Том 21. Вип. 1 (50). С. 79–96.

3. Захаров В. А. Аналіз сучасного стану операційного менеджменту на закордонних промислових підприємствах. *Молодий вчений*. 2017. Вип. 1. С. 75–82.

4. Halkiv L., Karyy O., Kulyniak I., Ohinok S. Innovative, Scientific and Technical Activities in Ukraine: Modern Trends and Forecasts. 2020 IEEE Third International Conference on Data Stream Mining & Processing (DSMP). 2020, Lviv, Ukraine,.

5. Official Website Asea Brown Boveri URL: https://abb.com (дата звернення:18 травня 2023) [In Sweden]

6. Промисловий менеджмент: теорія і практика : колективна монографія / за ред.: В. Г. Воронкової, Н. Г. Метеленко; МОН України, ІННІ ЗНУ. Запоріжжя : ЗНУ. 2020. 338 с.

7. Ящишина І. В. Суть та особливості смарт-підприємств. *Наукові записки Національного університету Острозька академія. «Економіка»*. 2018. Вип. 11 (39). С. 14–18.

Т. В. Кулініч, *Національний університет «Львівська політехніка».* ***Особливості промислового менеджменту в умовах застосування систем ABB Ability.***

Анотація. ***Мета статті*** *полягає у визначенні особливостей промислового менеджменту в умовах застосування системи ABB Ability.* ***Методика дослідження***. *Досягнення поставленої у статті мети здійснено за допомогою таких методів дослідження: логічного узагальнення та наукової абстракції, структурного аналізу, аналітичного методу та системного аналізу.* ***Результати***. *У межах дослідження ми розглядаємо ABB Ability не лише як комплексний набір цифрових технологій, послуг та рішень від корпорації ABB, але й як систему, яка завдяки фокусу на підвищенні ефективності, оптимізацію виробничих процесів та підтримку управління в різних промислових галузях, змінює формат промислового менеджменту підприємства. Керівництво корпорації Asea Brown Boveri, хоча і не розголошує назви підприємств, де застосовується їхня технологія через комерційні обмеження та конфіденційність даних клієнтів, зазначає, що станом на 2023 рік ABB Ability нараховує більше 63 тисяч користувачів (при цьому їх кількість продовжує зростати). При цьому на основі накопичених даних Asea Brown Boveri визначено, що застосування систем ABB Ability призводить до специфічних змін у структурі промислового менеджменту. Ці зміни стосуються наступних аспектів: систем планування виробництва (зокрема, підвищення гнучкості та точності систем планування виробництва), систем підтримки роботи виробничого обладнання та виробничих процесів, систем моніторингу, систем постійного вдосконалення та систем підтримки ефективності енергоспоживання. Проілюстровано, що ABB Ability може впливати на багато інших аспектів, таких як управління обслуговуванням, аналітика вартості, управління ланцюгом постачання тощо.* ***Практична значущість результатів дослідження***. *Врахування на практиці виділених змін у форматі та базових рисах промислового менеджменту, що відбуваються під впливом ABB Ability, дозволить вивчити, як цей процес впливає на стан організаційної культури, її інноваційність та адаптивність та проаналізувати загальну ефективність впровадження ABB Ability. Важливо визначити, наскільки успішно впроваджені зміни відображаються на ключових показниках продуктивності підприємства, таких як зниження витрат, підвищення продуктивності та поліпшення якості продукції".*

Ключові слова: *аналітика витрат, управління ланцюгом постачання, виробничі системи, сенсори, обладнання, планування.*