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Sustainability and Business Continuity Management for Production System in the Energy Sector in the Face of Increasing Uncertainty and Risk: Who Determines?

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ABSTRACT
The strategy for managing the continuity of operation and ensuring fault tolerance involves the development of approaches to assessing and monitoring the risks for the most important business processes. The article discusses approaches to the organization of interfunctional interaction in order to ensure the continuity of the activities for companies in the energy sector. The use of the "case study" method provided the examples of organizational structures and initiatives developed by energy companies in order to achieve the goals of automating business processes along with meeting the requirements for ensuring companies' sustainability.

Keywords: *Continuity of activity, Uninterrupted functioning of business processes, Sustainable development, Fault tolerance.*

1. INTRODUCTION

Business continuity management strategies are increasingly being implemented in companies represented in various industrial sectors. Factors such as socio-economic instability, climate change, regulatory policies pose a risk to the continuity of the organization's activities and draw the attention of companies to the development of a strategy for disaster preparedness and recovery in the face of these threats.

The COVID-19 pandemic has highlighted the need to implement business continuity management plans in many companies in order to comply with the requirements to move to a remote mode of operation and the restructuring of business models. In this regard, an important element of business continuity management is implementation of technological innovation.

Companies can improve their ability to ensure business continuity with properly integrated business process management and automation software. Software to achieve key business continuity indicators has been around for decades, but rising costs and the threat of unseen circumstances at all stages of the company's lifecycle significantly increase the need to improve such programs and development of effective algorithms for risk identification. The degree of risk of a particular process is largely determined by the consequences that threaten the failure of IT services. For example, in the banking sector, the shortest break in activity is associated with significant financial losses. If the incident occurred at the enterprise of the mineral resource complex, then people's lives are at risk. Digitalization of business processes entails significant changes in the implementation of the company's business processes, which cannot but affect the management of business continuity and the formation of corporate strategy.

2. ENSURING BUSINESS CONTINUITY IN RISK SITUATION

Ensuring business continuity is becoming a relevant topic for study both in academic research and in the business environment. Business continuity involves planning and preparing the company to implement business functions or quickly resume work in the event of an incident – a situation that can occur and lead to disruption, destruction, loss, emergency or crisis in the business. In the role of stakeholders (interested parties) are persons or organizations that can influence decisions or activities, and also be affected or feel affected by them [1]. The key goal of the continuity management strategy is to increase the company's resilience to incidents [2]. To achieve this goal, companies identify potential threats and predict the degree of their impact on their activities.

Nevertheless, as I. Mitrof notes, many companies do not have an adequate crisis management program supported by corporate culture and infrastructure resources [2]. The reason for this situation, researchers highlight the costs of introducing and implementing preventive measures to prevent the occurrence of incidents. Crisis management and emergency response methods are often singled out as precursors to the concept of continuity assurance [3]. Same as the crisis management, continuity management is aimed at developing and strengthening the company's ability to withstand the impending crisis consequences and maintain resilience. The key difference is the focus of the concept of continuity not only on the choice of the operational method of recovery, but also on ensuring the protection of bottlenecks in the processes identified as priorities in the framework of risk monitoring. An important element in the formation of such a concept is analysis of the functional interaction of various divisions of the company.

Moreover, the complementary function of crisis management in corporate strategy largely explains the need to consider the concept of ensuring continuity in the management of the company's business processes. In particular, crisis management measures strengthen the company's ability to adequately respond to emerging risk situations. At the same time, they complement the corporate strategy with “offensive capabilities” that arise as a result of ensuring continuous operation and maintaining a satisfactory level of customer service [4].

Awareness of the importance of implementing business continuity plans from the point of view of strengthening market potential and creating additional value for the company's customers allows us to develop a fundamentally different approach to the development of corporate strategy. The presence of a time lag in the provision of services or the delivery of goods reduces the competitive advantages of the company [5]. Continuity of activities contributes to the strengthening of the market position of companies, therefore it deserves consideration as part of the formation of the company's business process management strategy. It is worth noting that in recent decades the concept of business continuity has undergone significant changes, shifting the emphasis from disaster recovery to definition crucial business processes in the company that need to be maintained in the event of adverse events. The formation of the process of identifying sources of competitive advantages in the long term contributed to the evolution of the theory of crisis management into the concept of business continuity.

The implementation of business continuity plans clearly signals to the external environment about the readiness of the company's management to conduct a complex analysis of the company's business processes and investing in the search for additional competitive advantages.

It should be noted that despite the existence of international standards for business continuity management (ISO 22301), the uninterrupted strategy formed for the company must take into account industry specifics. The introduction of information technology in the main business processes contributed to the emergence of a direct relationship between the speed of execution and the continuity of processes from the technologies for processing and transmitting digital information, as well as systems. Speaking about ensuring business continuity from the point of view of IT, it is worth noting the focus of providers on the development of DRP solutions (disaster recovery plan) – plans for the restoration of IT activities during and after disasters. Nevertheless, DRP solutions are an integral part of the company's overall business continuity plan.

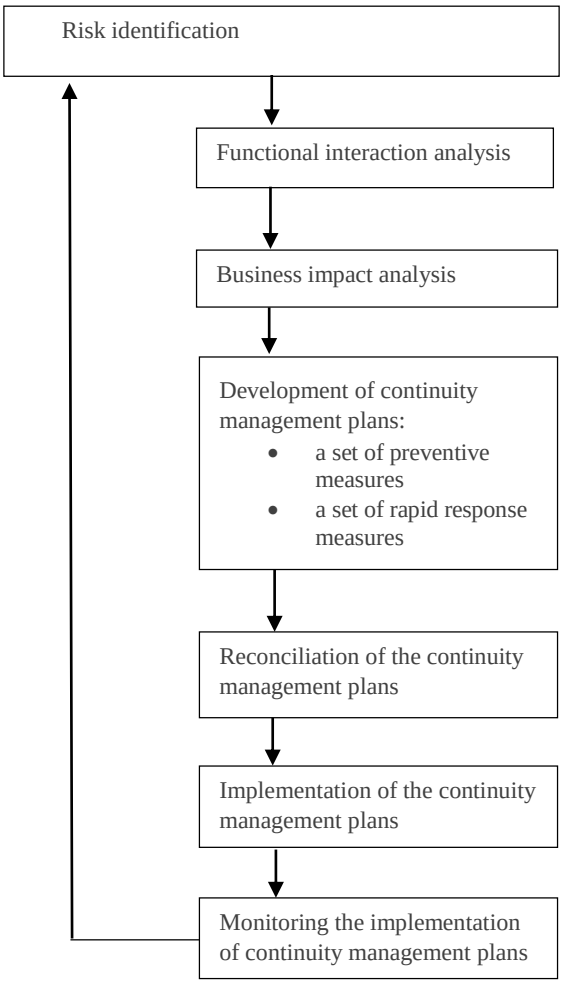

Figure 1 Stages of formation of the company's business continuity plan.

Other motivating factors for the implementation of the company's business continuity plan are distinguished [6]:

- safety of operations for staff and customers;

- the ability to quickly restore crucial business processes;
- compliance with obligations to interested parties;
- formation of the brand of a responsible employer;
- reduction of reputational risks;
- increasing customer and consumer loyalty.

Developing business continuity management plans begins with defining the organization's key goals and objectives. For each of their selected parameters, a list of potential threats and risks is identified. The risk identification stage is accompanied by the collection of information, including an overview of regulatory requirements and standards, the company's financial statements, an analysis of previous corporate strategies. Upon completion of this stage, researchers should have an idea of the conjuncture in which the company under study operates, external and internal factors are identified, and risk criteria are developed.

At the next stage, the functional interaction of the company's divisions is analyzed. The connecting components are the definition of MAO (maximum acceptable outage) or MTPD (maximum tolerable period of disruption) – the maximum allowable downtime in case of disruption of a business process. MAO is determined based on the possible consequences of the implementation of risk and the criticality of the process. If the MTPD is exceeded, it is likely that the company will lose its viability. This indicator can be calculated in minutes, hours, days, weeks and months.

To determine the degree of criticality of the organization's business processes, the method of business impact analysis (Business Impact Analysis, BIA) is actively used. The method is based on the assessment of recovery targets:

- RTO (recovery time objective): the period of time set for the resumption of deliveries of products or services, the resumption of activities or the replenishment of resources after an incident;
- RPO (recovery point objective): the state to which data used in a particular activity needs to be restored to ensure the resumption of that activity.

The results of the analysis should be reviewed after certain periods of time or after significant changes in the company's activities.

Based on the compiled list of risks for the company's priority business processes, a set of response measures is formed. Preventive measures are aimed at finding and protecting identified bottlenecks in the implementation of activities. A set of preventive measures is a way to reduce the risk of a trigger situation and minimize the negative effect due to increased fault tolerance of equipment or systems. The rapid response package includes resource recovery and the smooth functioning of processes. It is in the complex of response measures that it is customary to include the DRP solutions being developed.

Identification and analysis of the impact on the business can be carried out both for the whole company and for individual divisions or projects. It is worth noting that the assessment of single risks for a system element cannot be used as a comprehensive risk assessment of the system. The scope of the analysis should be specified at the initial stage of collecting information in order to obtain relevant results and optimize the efforts to collect the necessary information and agreed with the responsible units.

Monitoring the measures taken to respond to emerging threats forms the basis for the gradual improvement of the continuity management system, the adoption of corrective actions and the revision of the scope of the continuity management system, as well as business continuity policies and goals.

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3. PRACTICES OF AUTOMATED CONTROL SYSTEMS: A CASE STUDY

The largest players in the energy market are in favor of developing an integrated approach to the implementation of the principles of business continuity and risk analysis within a single cycle. From this perspective, business continuity management aims to ensure optimal recovery in the event of the realization of risk, the consequences of which cannot be eliminated in the mode of daily operation.

Austria's OMV Group has launched the DigitUp program, which aims to digitize OMV Upstream, oil and gas exploration, production and development business unit that improves efficiency and ensures business continuity.

A key project is the "Digital Drilling Rig of the Future": Drilling Cockpit and in the future Drilling Robot are designed to make drilling rigs safer, more efficient and more economical. The Drilling Cockpit system is fully automated. However, when deviations are detected, employees are called. The advantage of drilling cockpit in the development of several scenarios for the development of the drilling procedure. Compared to traditional standalone models and technologies, there is no need to search for information and tools; instead, they will be available at all times so that all staff can contribute to prompt decision-making. The system has already been implemented and allows to reduce the time cycle of the project from 12 to 4 months, as well as to improve the accuracy of laboratory measurements.

To take full advantage of the program's potential, OMV Upstream has begun upgrading its infrastructure. With cloud technology, more than 400 users can now access 1.6 petabytes of geological data and 170 applications online from any device around the world in a highly secure environment. The company has developed a global program covering the entire value chain in the field of exploration and production to accelerate the integration of digital technologies into daily activities, daily tasks.

In June 2017, BP invested $20 million in Beyond Limits – a startup that adapts software originally developed for robotic space exploration by NASA and the U.S. Department of Defense to commercial use.

Beyond Limits cognitive computing systems are aimed at automating human decision-making processes – they can fill in missing fragments of data sets.

More than 99 % of BP's oil and gas wells are equipped with sensors that continuously transmit data to help the BP team understand real-world conditions at each site, optimize equipment performance, and track maintenance needs to prevent breakdowns, allowing the company to achieve huge cost savings. BP's data sensors collect huge amounts of data on temperature, chemicals, vibration and other parameters of oil and gas wells, drilling rigs and facilities. Big data streaming technologies such as Kafka, Apache NiFi, Apex, Amazon Kinesis and Google Pub/Sub have the ability to deliver data from BP sensors, ready for processing, to special storage facilities such as Parquet files on Hadoop (HDFS).

At the beginning of 2020, the press center of PJSC Rosneft published news about the successful completion of a pilot project on the use of an automated intelligent drilling system (AIDS) at fields in the Orenburg region. The artificial intelligence system was implemented on drilling rigs and successfully passed pilot tests, justifying the plans entrusted to it. The principle of AIDS is similar to the action of the autopilot at the stage of drilling operations. By reading the input data, the system immediately adjusts the drilling process if necessary. The program gives the specialist a light and sound signal to achieve critical indicators and stop the program. Moreover, the AIDS sets the highest possible technical speed based on the data being read. For the operation of the AIDS, special ground and underground equipment must be installed. It allows specialists to monitor drilling remotely, which has become especially necessary during the 2020 pandemic. AIDS reduced mechanical drilling by a day and the cost of drilling one well by 5 million rubles. Moreover, the key achievement was the increase in the mechanical penetration rate by 15 % on average.

The Drilling Control Center (DCC) of Gazpromneft PJSC is the only center in the Russian oil and gas industry capable of providing simultaneous integrated engineering geological and technological support for the construction of complex wells. The main task of the Center is to ensure the most efficient use of data in the support and control of the construction process from more than 900 high-tech wells in the company's fields.

Continuous monitoring solves a number of complex tasks: it provides geonavigation (wiring of the shaft in a given interval), ensures the optimal technological mode (drill string speed, hammer load, penetration rate, etc.) and the properties of the drilling fluid necessary for the removal of sludge – destructible rocks, maintains the necessary pressure in the wellbore.

Geonavigation of a well with a complex trajectory is carried out according to geophysical data in real time, and an abundant flow of data for each well goes to the GeoNavigator DCC. These are the readings of sensors of geological and technological research, logging data during drilling, telemetry readings of directional drilling, drilling fluid parameters, etc. This approach allows you to effectively extract oil even from thin layers which power does not exceed three meters.

After the launch of the GeoNavigator DCC in 2012, such an indicator as “penetration efficiency”, that is, the

length of the horizontal part of the wellbore, which is located directly inside the oil-bearing reservoir, increased from 60 % to more than 90 %.

Further prospects for the development of the Drilling Control Center are associated with the introduction of new generation digital technologies, such as machine learning and work with a large amount of data.

4. CONCLUSION

At the moment, many companies note the need to develop business continuity strategies that allow us to constantly provide customers with critical services or products. Instead of focusing on disaster recovery, a business continuity plan should focus on ensuring the availability of critical operations. The implementation of such plans entails significant investments in the analysis of the organization's business processes and requires constant updating, requires high qualification of responsible specialists and standardization of corporate policies and procedures. On the other hand, companies that successfully implement continuity plans add value to the customer and employees by demonstrating their willingness to maintain a satisfactory level of service.

The accelerating pace of digitalization of business processes in many industries, including the energy sector, increases dependence on the smooth functioning of IT infrastructure. The considered examples of automated drilling control systems indicate the formation of internal organizational gaps, which become potential objects of continuity management due to the importance of the functions performed. Approaches to the management of such automated centers in accordance with the principles of continuity management are becoming a promising area of research.

REFERENCES

[1] M. Siponen, R. Willson, Information security management standards: Problems and solutions. Information & Management, 2009. 46(5): 267–270 pp.

[2] I. Mitroff. Why Some Companies Emerge Stronger and Better from a Crisis. New York: Amacom. 2005.

[3] B. Hernabe, D. Elloit, E. Swartz. Business Continuity Management: time for a strategic role? Long Range Planning Magazine, 2004.

[4] J. Lam. Enterprise Risk Management: From Incentives to Controls. John Wiley & Sons, Hoboken. 2014. http://dx.doi.org/10.1002/9781118836477

[5] J. Lindstrom, S. Samuelson, A. Hagerfors. Business continuity planning methodology. Disaster Prevention and Management, 2010, 19(2): 243–255.

[6] H. Urbancova. The Benefits of Business Continuity Management in Czech Organizations. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunen. 2015.

[7] KPMG Report. Business Continuity Management: Pandemic Influenza Crisis Response.2020.

[8] S.A. Petrenko, A.V. Belyaev, “Business continuity management. Information technologies for engineers”. Moscow: DMK Press Publ., M.: IT Company, 2011. 400 p.

[9] I. Maksimtsev, N. Trifonova, A. Maizel, I. Pivovarov, “International business: a textbook for universities. Third generation standard 3++”, St. Petersburg: Piter Publ., 2018. 704 p.