

RISK MANAGEMENT IN THE CONTEXT OF COVID-19 PANDEMIC IN AN ENTERPRISE – ISHIKAWA CAUSE-AND- EFFECT DIAGRAM

doi: 10.2478/czoto-2021-0026

Date of submission of the article to the Editor: 28/11/2020

Date of acceptance of the article by the Editor: 26/03/2021

Piotr Saja¹ – *orcid id: 0000-0002-8607-9455*

Artur Woźny² – *0000-0002-0294-0157*

Lucia Bednarova³ – *orcid id: 0000-0002-8582-0643*

¹ Rzeszów University of Technology, **Poland**

² Podkarpackie Centre for Teaching Services, **Poland**

³ Technical University of Kosice, **Slovakia**

Abstract: Business continuity depends on the quality of management of individual processes. The management team strives to anticipate all possible threats and define protective measures. In the event of the COVID-19 pandemic enterprises were not prepared for such threats. Therefore, an important role is played by the health and safety inspector who should be involved in the company management process. The impact of the safety aspects of the work environment on the quality and efficiency of work is even more important in the event of an unexpected hazard that is difficult to completely eliminate. The purpose of the paper is to present the causes and effects of the COVID-19 biohazard according to the Ishikawa diagram on the example of a selected process in an enterprise.

Keywords: risk management, Ishikawa diagram, COVID-19 hazard analysis

1. INTRODUCTION

The operation of enterprises in market economy requires a pragmatic approach to planning processes. It is about a close link of the various forms of the plan with:

- company goals,
- the nature of the business,
- proper organization of activities,
- controlling and evaluation,
- planning new activities.

However, it should be pointed out that during their operation enterprises may be exposed to various types of anomalies, which they disrupt partially or completely. An ability to anticipate these anomalies is an important task for management. While it is possible to prepare and apply preventive measures in the face of risks related to failures and inspections of supervisory institutions, it is difficult to react properly in the face of unforeseen events that may occur (Wolany and Spilka, 2011).

Therefore, it is important how a given enterprise secures its resources against unexpected events that may occur in the economic or social space. The risk is inherent in the daily activities of a company, although the risk related to COVID-19 was difficult to identify (Woźny and Dobosz, 2015).

2. RISK MANAGEMENT

It seems natural human behavior to search for ways to eliminate or limit all possible losses related to an economic activity. Therefore, risk management covers the following areas: risk analysis, active risk modification (an attempt to eliminate, limit, relocate) and risk financing, consisting in searching for ways to cover possible losses through insurance or including them as own costs (Baryshnikova et al., 2021; Woźny and Pacana, 2017).

Risk management is a more and more commonly used tool for to improve organization management. In general, risk management is about identifying and analyzing various types of events that have the potential to cause undesirable (or desired) changes to a process or product, and developing a response to risk. A risk can be characterized as an identifiable event with a certain probability of its occurrence and its expected effect (Gula and Fatih, 2018).

Every enterprise faces risk during its management. It can be caused by external factors (nature, economic conditions, functioning of the global market), but also by internal ones (process risk, occupational risk, etc.). It is important that an entrepreneur and management are aware of the risk and the situation in which the external and internal risk can occur simultaneously. Such action allows one to protect against potential losses or reduce the impact of risk on the functioning of a company.

The current situation in the world has meant that the COVID-19 pandemic has been a constant external and internal risk for a company for over a year. Therefore, it is important what actions are taken by management not only in combating external risk, but also what activities it takes to combat internal risk. It should be pointed out that this risk affects every aspect of the company operation as there is a possibility of infection of employees both inside and outside the company.

In the case of COVID-19, the external or internal risk will have negative financial and social consequences for the still functioning enterprise (Woźny and Pacana, 2017).

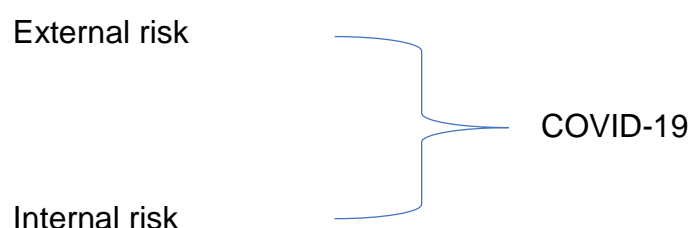


Fig. 1. Risk connected with the COVID-19 pandemic

2.1. Biological hazard identification - COVID-19

During a crisis, the threat of the COVID-19 pandemic is common. Therefore, in most workplaces, it was necessary to update the occupational risk with a biological factor, which should be considered the coronavirus. Table 1 shows the hazard identification. The possible effects of the threat, as well as the measures to protect against the threat

that the employer and employee should take were indicated (Woźny and Pacana, 2017).

It is important that, in times of uncertainty and limited sense of security, an employer protects employees against the possibility of infection. Therefore, it is important what protection measures were used by the employer and what mechanisms and procedures were applied. Most employers provided employees with:

- disposable or reusable masks and shields,
- disposable gloves,
- hand disinfectant,
- separation of the zone for customers or people from outside,
- separation of the employee's position from the client with plexiglass, etc.,
- shortening the working time or organizing remote work,
- other procedures and protective measures depending on the workplace (Saja et al., 2017).

Table 1
19 COVID-19 biohazard identification.

Biological threat			
Threat	The source of the threat (cause)	Possible consequences of the threat	Means of protection against threats
Group	The way of infection		Employer
Virus Coronaviridae (COVID-19)	People, items	Diseases of the upper respiratory tract, including pneumonia, severe damage to internal organs, death, etc.	<ul style="list-style-type: none"> • disposable or reusable masks and visors, • disposable gloves, • hand disinfectant, • separation of the zone for customers or people from outside, • separation of the employee's position from the client with plexiglass, etc., • shortening the working time or organizing remote work, • other procedures and protective measures depending on the workplace.
gr. 2, no vaccinations (or their limited access)	Air-droplet		Employee <ul style="list-style-type: none"> • compliance with hygiene rules • adherence to employer procedures and ministry guidelines • use of personal protective equipment

Source: own study

2.2. Ishikawa diagram of COVID-19 threat at the position of a truck operator at a handling terminal

Ishikawa's cause-and-effect diagram allows analyzing the causes of irregularities in the implementation of a specific activity. The aspect of linking individual causes with a diagram is also important. The detailed analysis of the diagram enables to link the causes of the problem. Such a diagram is effective in the case of teamwork using appropriate management techniques (e.g. with brainstorming).

The simplest division of the causes of irregularities in an enterprise is the 5M rule, i.e. hierarchizing irregularities by category (Pacana and Siwiec, 2020):

- Method,
- Machine,
- Material,
- Man,
- Management

Identifying the risk associated with COVID-19 by dividing it into categories allows one to improve the process of analyzing the risk and its proper interpretation. It will also allow reducing information noise (communication errors) between the units participating in the procedure. So that the sender and the recipient speak the same language or code and there should be a full understanding of the issued command and the expected tasks to be performed (Head, 1994).

Before considering the mistakes of the owner and all employees, it is worth highlighting the factors that determine the possibility of contamination. It often happens that the employer and employees do not know enough safety rules and procedures or ignore the guidelines set by state institutions. This problem is closely related to the "management" factor.

The Ishikawa diagram allows eliminating weaknesses and possible irregularities in the process. In the company analyzed, attention was paid to the workstation of a truck operator at the transshipment terminal.

The outbreak of COVID-19 forced many changes in enterprises. As for the "method" according to the Ishikawa diagram, the following should be mentioned:

- No specific rules regarding COVID-19,
- Unchanged procedures of logistic processes,
- Lack of instructions regarding contact with an infected or potentially sick person,
- No rules for measuring temperature.

The management should rearrange the workplaces in such a way as to limit the possibility of a direct contact of a larger number of people. It is impossible to completely eliminate contact, although it can be limited, and all necessary protection measures should be implemented.

It should be emphasized that from the beginning of the COVID-19 pandemic there are only recommendations that have been obligatory in place in Poland (e.g. the recommendation of the Chief Sanitary Inspector about keeping distance, using masks, etc.). There are no clear rules set out in a regulation that employers must adhere to. As for the "human" aspect, the cause of infection may be:

- Failure to respect social distance,
- Not wearing masks and not disinfecting hands,
- Unjustified contact with contractors,
- Not taking care of basic hygiene rules,
- Stress (Vries et al., 2016).

The management should inform employees about the threat and build awareness in atmosphere of peace and common sense about the threat. Only the discipline of employees and control over compliance with the implemented safety rules can bring the expected benefits.

In the process analyzed, attention was paid to the operator of the truck. The employees can be infected by:

- The use of several trucks in one shift by one or more employees,
- Non-disinfection of trolley elements the employee comes into contact.

It is important to change the organization of work processes related to mechanical transport works. The rules for using industrial trucks and the need for their disinfection should be specified. This can be done during the employee's break or after the shift is completed (designate breaks in use for disinfection) etc.

Management can contribute to the threat when they downplay the problem. One should pay attention to:

- No COVID-19 procedure,
- No updating of occupational risk,
- No restrictions on contact with participants in the logistics process,
- Lack of proper supervision.

The management should implement new organizational solutions. If possible, work processes should be run remotely, e.g. no printing of documents, electronic waybills, etc. (which generates additional costs).

The employer should equip the employee and the company with protection measures. Due to COVID-19, there may be a problem with (Michaels and Wagner, 2020):

- Lack of masks/shields etc.,
- Lack of disinfecting liquid,
- Damaged fluid dispenser or their insufficient quantity,
- Defect in thermometer.

Providing employees with personal protective equipment is one of the basic tasks of employers in the field of occupational health and safety. It is important that the employer adjusts the type and amount of resources to the type or process of work.

The Ishikawa diagram shows the number of causes of COVID-19 infection in a company. Therefore, it is important to implement the necessary preventive measures to eliminate problems. It is relevant that the management staff who will reorganize work processes pay attention to the safety aspect. Temporary reduction of efficiency or a throughput of processes at the expense of security can bring many benefits in the long run. This can save the enterprise from partial or complete closure related to employee infections (Saja, 2017).

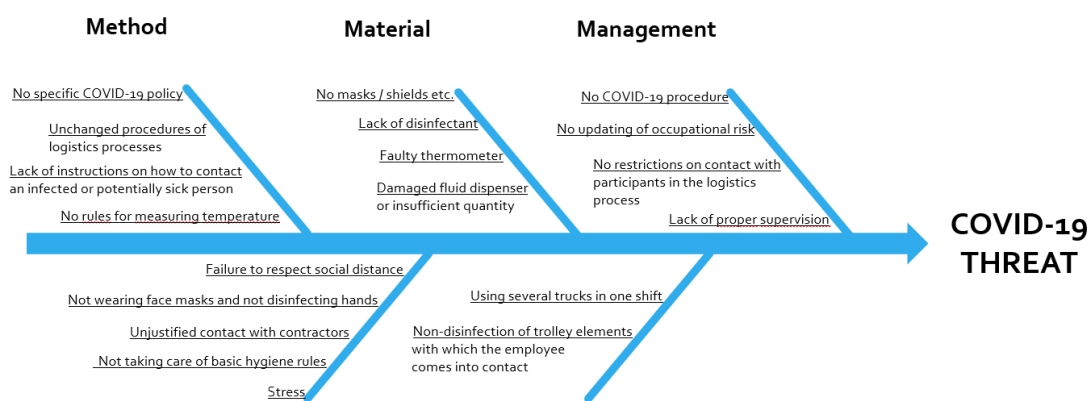


Fig. 2. Identification of biological hazards COVID-19

2.3. Risk analysis of COVID-19

When the COVID-19 threat emerged, it was difficult to identify the type of biological threat. It was a new biological threat that had not been exposed to humans until now. Therefore, it was difficult to pinpoint the potential effects that could have had on the worker.

Table 2 presents the risk assessment using the Risk Score method by means of the causes and effects indicated in the Ishikawa diagram. It should be noted that the results of the assessment relate to the general approach to risk assessment for an employee. It should be emphasized that the generally accepted methods do not differentiate occupational risk in terms of age, gender or coexisting diseases. It is also important that in the case of the factors indicated, the result of the assessment would certainly be significantly different, as the effects of virus infection may be incomparable for younger and elderly people, or those with comorbidities.

Table 2
Risk estimation by means of Risk Score – COVID-19.

Name of the occupational hazard factor	The severity of possible consequences "S"		Time of exposure to the hazard "E"	The probability of an event "P"	Occupational Risk Score "R"	
Estimation formula: S x E x P = R						
Virus Coronaviridae (COVID-19)	S=7	Average	E=6	P=3	R=126	Average risk
	Severe body injury		Daily	Practically possible	Necessary control, recommended preventive actions	

Source: own study

3. CONCLUSIONS

Personal protective measures are only a result of the hazard analysis. One needs to be aware of the threat and react appropriately. Entrepreneurs are required to organize work properly by:

- Information management,
- Processing information,

- Displaying information,
- The way of information visualization,
- Reliability of information,
- Repeatability of information.

In the event of the COVID-19 pandemic it is difficult to predict therefore organizational mechanisms that enable quick response to the resulting threat, creating an increased level of safety for employees are the most important.

COVID-19 is a new generation virus, so far unknown. Therefore, both medicine as well as science and society begin to recognize the following effects:

- Medical for people who have undergone it and returned to work,
- Social, due to isolation caused by remote work, a decline in social competences, stress caused by both work and childcare at the same time,
- Economic, due to the lower efficiency of employees after illness (e.g. neurological complications, temporary disturbance of the sense of smell and taste, increased energy expenditure).

REFERENCES

- Baryshnikova, N., Kiriliuk, O., Klimecka-Tatar, D., 2021. *Enterprises' strategies transformation in the real sector of the economy in the context of the COVID-19 pandemic*, Production Engineering Archives, 27(1), 8–15. DOI: 10.30657/pea.2021.27.2
- Gula, M., Fatih, M., 2018. *A comparative outline for quantifying risk ratings in occupational health and safety risk assessment*, Journal of Cleaner Production, 196, 20, 653-664.
- Head, G.L., 1994. *Controlling warehouse hazards*, Professional Safety, Des Plaines, 39, 10, 55.
- Michaels, D., Wagner, G.R., 2020. *Occupational Safety and Health Administration (OSHA) and Worker Safety during the COVID-19 Pandemic*, JAMA October 13, 324(14), 1389-1390.
- Pacana, A., Siwiec, D., 2020. *Improving the process of analysing the causes of problem by integrating the Ishikawa diagram and FAHP method*, Scientific Papers of Silesian University of Technology Organization and Management Series, 143, 2020, 247-257.
- Saja, P., 2017. *Doskonalenie zarządzania bhp terminalu przeładunkowego firmy logistycznej*, Zeszyty Naukowe Politechniki Częstochowskiej Zarządzanie, 25, Częstochowa.
- Saja, P., Woźny, A., Pacana, A., Dobosz, M., 2017. *Additional components of risk assessment and their impact on the probability parameter*, Production Engineering Archives, 14, 11-14. DOI: 10.30657/pea.2017.14.03
- Vries, J., Koster, R., Stam, D., 2016. *Safety Does Not Happen by Accident: Antecedents To A Safer Warehouse*, Production and Operations Management Society, 25, 8, 1377-1390.
- Wolany, W., Spilka, M., 2011. *Influence of safety culture on the safety level in chosen enterprise*, Journal of Achievements in Materials and Manufacturing Engineering, 49, 2, 507-513.
- Woźny, A., Pacana, A., 2017. *Synthetische Auffassung der Methoden für Gefährdungsbeurteilung*, Franciszek Hadam Euro-Capitol, Friedrichshafen.