# CONCEPT OF THE COMPETENCE CENTER AT THE SILESIAN UNIVERSITY OF TECHNOLOGY – INNOVATIVE PARTNERSHIP OF SCIENCE AND INDUSTRY IN THE FIELD OF SAFETY AND CRISIS MANAGEMENT

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**Purpose:** The aim of the article is to present the key assumptions and the importance of creating the Competence Center at the Silesian University of Technology, which is to be an innovative partnership between science and industry in the area of security and crisis management. The article aims to draw attention to the need to change the approach to safety in industry and to open new opportunities for employers, academic staff and students by integrating the latest scientific achievements with industrial practice.

**Design/methodology/approach:** The first method is the literature analysis: analysis of international literature from main databases and Polish literature and legal acts connecting with the researched topic. Moreover, the article presents a specific concept of the competence center that is being established at the Silesian University of Technology.

**Findings:** The findings indicate that creating a Competence Center at the Silesian University of Technology can significantly enhance safety and crisis management in industry by integrating scientific advancements with industrial practices. The proposed structure and methods for the Center emphasize modern training programs, crisis simulations, and the use of advanced technologies like AI and data analysis to improve risk management.

**Originality/Value:** The article presents the original concept of the new groundbreaking Competence Center for security and crisis management at the Silesian University of Technology.

**Keywords:** competence center, security, crisis management, innovation, science-industry partnership.

**Category of the paper:** conceptual paper.

# 1. Introduction

Silesian University of Technology in Gliwice, in cooperation with the Institute of Mineral Raw Materials and Energy Management of the Polish Academy of Sciences with the participation of the following companies: JSW Szkolenie i Górnictwo Sp. z o. o. and JSW IT Systems, begins work on a groundbreaking initiative – the creation of a Competence Center in the field of Security, Operational Analytics and Management of Hazardous Situations in Industry. This project aims to change the approach to safety in industry, but also to open new perspectives for employers, academic staff and students.

The purpose of this publication is to present the most important assumptions of the creation of the Competence Center at the Silesian University of Technology regarding innovative partnership of science and industry in the field of security and crisis management.

# 2. Literature background

## 2.1. University-industry cooperation

As literature proves, cooperation between universities and industry is vital for fostering innovation and driving economic growth (Szücs, 2018). Szücs finds evidence for significant knowledge spillovers and size effects when it comes to this cooperation. The author also confirms in the research that universities help to generate knowledge transfer. The findings from another paper (Sa'diyah et al., 2024) show that effective collaboration between industry and universities can bridge the gap between theory and practice. It can also enrich the curriculum and enhance graduates' readiness for the market to get their future job. Moreover, this type of cooperation helps provide better quality resources, such as technology and educational facilities. Also, it is crucial for improving the quality of business and management education and producing more competent and job-ready graduates. Another benefit is the transfer of cutting-edge knowledge and technology to real-world settings (Arenas and González, 2018).

Universities provide foundational research and a skilled workforce, while industries offer practical insights, funding, and opportunities for applied research. There are also many programs on the market that encourage university-industry partnerships (Caloghirou et al., 2001). They have regional, national and international scope. Such partnerships enhance the relevance of academic research, contribute to the development of new technologies and solutions (Nam et al., 2019), and ensure that educational programs align with industry needs (Bektaş, Tayauova, 2014), ultimately benefiting society through advancements and improved

competitiveness. These, in turn, foster economic growth and enhancing the quality of life (Afonso et al., 2012).

This type of collaboration is also important for searching for talented future workers (Zhang, 2018). Universities which cooperate with the industry are better positioned to identify and nurture emerging talent, providing students with practical experience and exposure to industry challenges. Such partnerships create a pipeline of skilled graduates who are well-prepared to meet the demands of the job market, ensuring that companies can recruit employees who have the necessary expertise and hands-on experience to drive innovation and productivity.

## 2.2. Safety and crisis management competencies currently

Safety and crisis management competencies are critical in today's increasingly unpredictable world, as they equip individuals and organizations with the necessary skills and knowledge to effectively prevent, respond to, and recover from various emergencies. These competencies encompass a wide range of abilities, including risk assessment (Wróblewski et al., 2015; Wróblewski, 2011), emergency planning (Perry, Lindell, 2007), communication strategies (King, 2009), and rapid decision-making under pressure (Leland, 2009). Mastery of these skills ensures that potential threats are identified and mitigated before they escalate, thereby reducing the likelihood of harm and damage.

In educational institutions, workplaces, and public spaces, having personnel trained in safety and crisis management fosters a culture of preparedness and resilience. This not only protects human lives but also preserves property, maintains operations, and ensures the continuity of essential services during and after a crisis. Furthermore, proficient crisis management can enhance an organization's reputation, build trust among stakeholders, and demonstrate a commitment to safeguarding the welfare of the community (Kouzmin, 2008). In essence, developing and maintaining robust safety and crisis management competences is indispensable for any organization aiming to navigate the complexities of contemporary challenges and maintain stability in the face of adversity (Valackiene, 2011).

In the context of today's rapidly evolving work environment, safety and crisis management have become more crucial than ever. The modern workplace faces a myriad of challenges, including cyber threats (Bécue et al., 2021), natural disasters, pandemics (Davies, 2020), and workplace violence (Brous, 2018), all of which require comprehensive preparedness and swift response strategies. Effective safety and crisis management in the workplace not only protect employees' physical well-being but also their mental health, fostering a secure and supportive work atmosphere. Organizations equipped with robust safety protocols and crisis management plans can minimize disruptions, maintain operational continuity, and protect their assets. Furthermore, these competencies ensure compliance with regulatory requirements and enhance the organization's reputation by demonstrating a proactive commitment to employee safety and welfare. As remote and hybrid work models (Gupta, 2022) become more prevalent, the scope of safety and crisis management must also adapt, addressing issues such as

cybersecurity, home office ergonomics, and remote emergency response plans (Porcu et al., 2022). Ultimately, prioritizing safety and crisis management in the workplace builds a resilient workforce capable of effectively navigating and overcoming the uncertainties of today's complex work landscape.

It is worth emphasizing that training in competences in the field of security and crisis management is extremely important, especially in today's global context. The COVID-19 pandemic, which surprised a world unprepared for such a huge challenge, forced societies and organizations to quickly adapt to new realities, especially those related to work, education and dealing with matters via the Internet (Espitia et al., 2022; Priyono et al., 2020; Stecuła, Wolniak, 2022). Acquiring competences in the field of security and crisis management is crucial in the context of epidemics and pandemics, which require solid preparation. Lack of appropriate skills can lead to numerous health, social and economic problems (Peñarroya-Farell, Miralles, 2022).

Another significant threat is armed conflicts, as occurred in 2022 when Russia attacked Ukraine. In this context, acquiring competences in crisis management and practical skills related to responding to wars, attacks and invasions is extremely important. Practical skills and effective technology are essential to function and find your way in the world during such crises. This technology can be very broad, for example there are AI tools (Neads et al., 2023) used for different military purposes, armed drones (Enemark, 2013), robotics (Vestner, Lusenti, 2023) and many more. Therefore, training centers in the field of security and crisis management play a key role in preparing societies to face modern threats, especially in times of unstable political situation in the world.

## 2.3. Importance of creating safety and crisis management center at university

Creating crisis management centers at universities is extremely important for both society and industry. Universities, as centers of science, innovation and research, play a key role in preparing future leaders and specialists to effectively deal with various crisis situations. The introduction of such centers on university campuses allows for practical training of students in crisis management, which is necessary in the face of global threats such as the COVID-19 pandemic, natural disasters, terrorist attacks or cyberattacks.

For society, crisis management centers at universities offer invaluable value by creating space for research on new methods and technologies for responding to crises. Students and scientists can test and improve emergency management strategies, which translates into better prepared communities for unexpected events. The activities of such centers also increase public awareness of the importance of crisis preparedness and promote cross-sector cooperation, combining academic resources with local and national emergency services.

From the industry's point of view, crisis management centers at universities can become a key partner in developing and implementing modern security and risk management solutions. The industry often looks for qualified specialists who are not only theoretically prepared, but also have practical experience in crisis management. Universities with such centers can
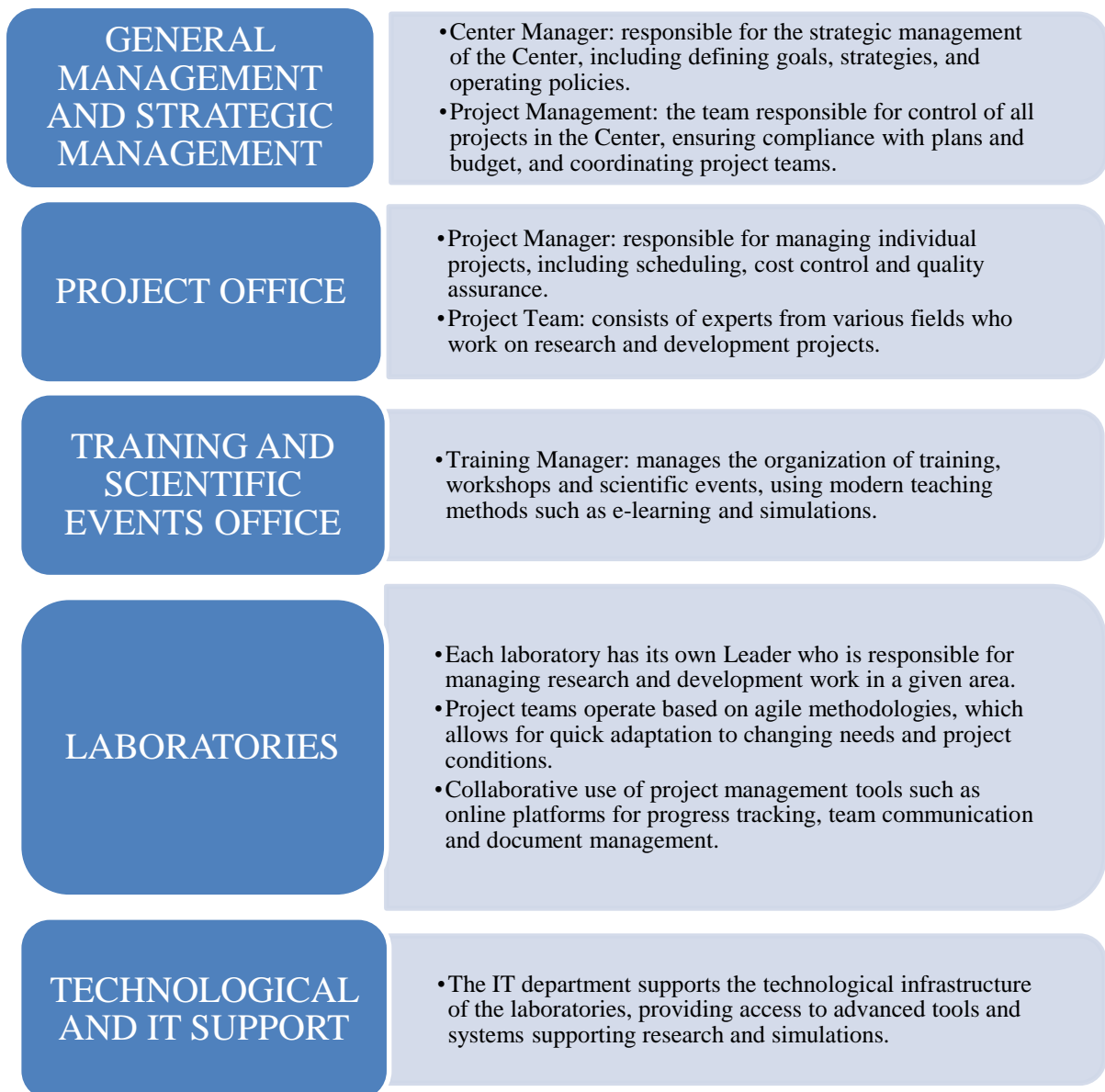
better prepare their graduates for work in sectors where the ability to quickly respond to crises is crucial, such as energy, transport, public health or information technologies. Thanks to this, the industry gains employees who can effectively minimize risk and manage crisis situations, which translates into the stability and operational continuity of companies and institutions.

## 3.  The structure of Competence Centre

The new Competence Center will consist of six advanced laboratories that together will create a unique research and training platform on a European scale. Each laboratory will specialize in key areas related to security and crisis management.

1. Digital Twin Laboratory – this lab will be the heart of the real-time analytics, production and security management platform in the cognitive industry. Thanks to the digital twin of the mine control room, it will be possible to fully simulate the operation of the plant, which will allow for realistic training for both mining crews and students.

2. Crisis Management Laboratory – it will focus on the virtualization and simulation of emergency management models in industry. It will be a key tool for training operators and developing standards of conduct in emergencies and natural disasters.

3. AI, Operational Analytics and Information Processing Laboratory – the heart of the entire Center, which will supply all scientific and teaching laboratories, while also serving as a research training ground for students. This center will enable testing of the cyber resilience of industrial automation systems, filling an important gap in cybersecurity education and research.

4. Laboratory for Sustainable Management of Raw Materials and Energy – it will enable interdisciplinary education of engineers in the field of sustainable management of raw materials and energy. By simulating the conditions for obtaining raw materials, this laboratory will contribute to intensifying research on the energy transformation and circular economy.

5. Laboratory of Photogrammetry, Remote Sensing and Geomatics – it will educate specialists in the latest geoinformatic technologies, with applications in terrain monitoring, forest resources management, crisis analysis and spatial planning.

6. Situational Awareness Laboratory – it will be a center for real-time monitoring, analysis and response in an industrial environment. Integration of data from various sources will enable comprehensive management of emergency situations.

The structure of the Competence Center in the field of Security, Operational Analytics and Management of Hazardous Situations in Industry is designed in a way that enables effective conduct of research, training, and projects. The structure of the Center is shown in Figure 1.

| GENERAL MANAGEMENT AND STRATEGIC MANAGEMENT | • Center Manager: responsible for the strategic management of the Center, including defining goals, strategies, and operating policies.<br>• Project Management: the team responsible for control of all projects in the Center, ensuring compliance with plans and budget, and coordinating project teams. |
| PROJECT OFFICE | • Project Manager: responsible for managing individual projects, including scheduling, cost control and quality assurance.<br>• Project Team: consists of experts from various fields who work on research and development projects. |
| TRAINING AND SCIENTIFIC EVENTS OFFICE | • Training Manager: manages the organization of training, workshops and scientific events, using modern teaching methods such as e-learning and simulations. |
| LABORATORIES | • Each laboratory has its own Leader who is responsible for managing research and development work in a given area.<br>• Project teams operate based on agile methodologies, which allows for quick adaptation to changing needs and project conditions.<br>• Collaborative use of project management tools such as online platforms for progress tracking, team communication and document management. |
| TECHNOLOGICAL AND IT SUPPORT | • The IT department supports the technological infrastructure of the laboratories, providing access to advanced tools and systems supporting research and simulations. |

**Figure 1.** The structure of the Center.

## 4. Methods of providing activity

The Competence Center in the area of security, operational analytics and risk management in industry uses various mechanisms to ensure activity and effective operation. They include the following:

- It is planned to implement modern training programs enabling staff and co-workers to update their knowledge and skills related to security and risk management. These training courses include the latest methods and tools used in the industry as well as practical crisis scenarios that allow you to be better prepared to operate in real conditions.

- Organized simulations of crisis situations are an important element of the training process. They allow for practical testing of crisis management strategies, cooperation between different teams and identification of areas that require improvement. By participating in simulations, staff can gain valuable experience and improve their skills, which translates into better preparation to deal with real crisis situations.

- Research and analysis of trends in the field of industrial safety. Tracking and analyzing incident data and trends allows you to identify potential threats and implement appropriate preventive measures. Thanks to this, the Center can stay up to date with the latest trends and best practices in the industry, which allows it to effectively respond to changing conditions and needs.

- Establishing partnerships and cooperation with other institutions, research, government and industry, is a key element of the Competence Center's strategy. This cooperation enables the exchange of knowledge and experience as well as access to best practices. These partnerships can also lead to joint research projects, which allows for the development of new industrial security solutions and technologies.

- Regularly monitoring and auditing security systems and management procedures. These audits allow for the identification of potential security gaps and the assessment of the effectiveness of preventive actions. This makes it possible to quickly make corrections and adapt the strategy to changing conditions.

- Use of advanced technologies such as artificial intelligence and data analysis. The use of these technologies enables more precise monitoring of the situation, faster data analysis and better risk management. Thanks to this, the Center can respond faster to changing conditions and needs and minimize the risk of crisis situations.

- Systematic risk management – systematic identification, assessment and management of risks helps to minimize the possibility of dangerous situations and prepares for quick response in the event of their occurrence. Thanks to this, the Center can effectively manage risk and minimize its negative effects. Building a safety culture is a key element of the Competence Center's strategy.

- Building an organizational culture in which safety is a priority and promoting employees' awareness and responsibility in the field of safety contributes to ensuring the activity and effectiveness of activities in the Competence Center. By promoting employee awareness and responsibility, the Center can more effectively prevent crisis situations and minimize their negative effects.

- The performance monitoring system and Key Performance Indicators (KPIs) are key to ensuring the effectiveness of the Competence Center's activities. The performance monitoring system, which includes the compilation and analysis of KPIs, enables the identification of areas requiring improvement and the taking of corrective actions to increase the effectiveness of operations.

- Regular reviews of procedures and processes, which are carried out by specialists, enable the identification of areas requiring improvement and the proposal of appropriate changes to procedures and processes. This makes it possible to ensure that procedures and processes are up to date and effective.

- Regularly organizing training and workshops to improve employees' skills and knowledge, which concern new technologies, work methodologies and current trends in the field of security and risk management, enable maintaining a high level of knowledge and skills needed for effective operation. By investing in the professional development of employees, the Center can more effectively prevent crisis situations and minimize their negative effects.

- The business continuity management system, which includes emergency plans, emergency procedures and crisis readiness testing, enables quick response to emergency situations and minimizing disruptions to the Center's operations in the event of a threat. Through systematic business continuity management, the Center can more effectively prevent crisis situations and minimize their negative effects.

- Monitoring trends and innovations in the industry. Tracking and analyzing trends and innovations in the field of security and risk management allows you to adapt strategies and practices to changing needs and challenges in the industry and allows you to maintain competitiveness and activity at the Center. This makes it possible to respond faster to changing conditions and needs and introduce innovative solutions.

All these mechanisms work together to create a coherent strategy to ensure the activity and effective operation of the Competence Center in the field of security, operational analytics and management of risk situations in the industry. Thanks to them, the Center can more effectively prevent crisis situations, minimize their negative effects and respond faster and more effectively to changing conditions and needs.
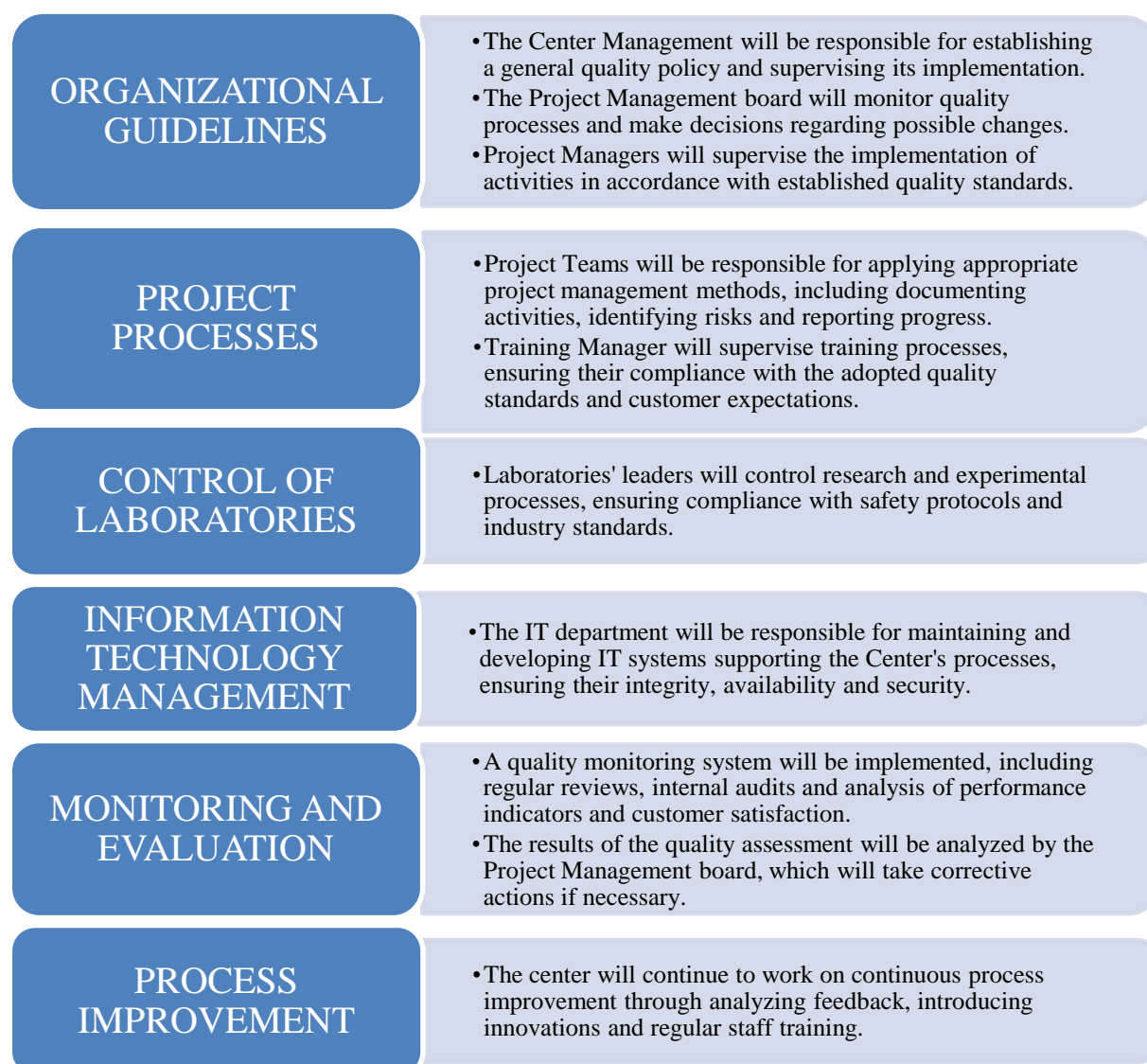
## 5. Ensuring quality control of the Center's activities

Ensuring the quality of the activities of the Competence Center for Safety, Operational Analytics and Management of Hazardous Situations in Industry is a key element in achieving operational success and satisfaction of potential customers. In the face of the dynamic requirements of the industry, it becomes necessary to establish an effective quality control system that will effectively support the achievement of the organization's goals. In the initial phase of the Center's operations, the internal quality system becomes the foundation on which all processes and activities will be based. This is not only a necessary condition for effective functioning, but also a tool enabling adaptation to the changing needs and expectations of customers and the business environment. However, when considering the Center's long-term

development and competitiveness in the industrial market, it is also necessary to look to the future. As the Center develops its competences and gains experience, it is planned to use external, standardized quality systems. This is a step that will enable further streamlining of processes, increasing the transparency of operations and building trust among scientific and business partners.

In the context of the analysis of potential ways of ensuring quality control of the Center, its organizational structure was taken into account, including the Management, Project Management, Project Managers, Project Teams, Training Manager, Laboratory Leaders and the IT Department, as shown in Figure 2.

| ORGANIZATIONAL GUIDELINES | • The Center Management will be responsible for establishing a general quality policy and supervising its implementation.<br>• The Project Management board will monitor quality processes and make decisions regarding possible changes.<br>• Project Managers will supervise the implementation of activities in accordance with established quality standards. |
|---|---|
| PROJECT PROCESSES | • Project Teams will be responsible for applying appropriate project management methods, including documenting activities, identifying risks and reporting progress.<br>• Training Manager will supervise training processes, ensuring their compliance with the adopted quality standards and customer expectations. |
| CONTROL OF LABORATORIES | • Laboratories' leaders will control research and experimental processes, ensuring compliance with safety protocols and industry standards. |
| INFORMATION TECHNOLOGY MANAGEMENT | • The IT department will be responsible for maintaining and developing IT systems supporting the Center's processes, ensuring their integrity, availability and security. |
| MONITORING AND EVALUATION | • A quality monitoring system will be implemented, including regular reviews, internal audits and analysis of performance indicators and customer satisfaction.<br>• The results of the quality assessment will be analyzed by the Project Management board, which will take corrective actions if necessary. |
| PROCESS IMPROVEMENT | • The center will continue to work on continuous process improvement through analyzing feedback, introducing innovations and regular staff training. |

**Figure 2.** Ensuring quality control.

The responsibilities of the Directorate and the Project Management Board in the Competence Center in the field of Safety, Operational Analytics and Management of Hazardous Situations in Industry include a number of key tasks aimed not only at effective process management, but also at improving the quality of services provided and research and development projects. The priority tasks include subjecting quality goals to constant reviews

and evaluation in order to confirm their usefulness and degree of implementation, ensuring that the adopted quality policy is known to all employees of the Center, understood and respected. It is also important to raise awareness of the need to involve the entire team in the process of improving the quality of services and develop the belief that each employee is responsible for the quality and image of the Center, preventing the causes of irregularities through team problem solving and eliminating internal causes of errors, delegating rights in accordance with the principle of compliance scope of tasks, powers and responsibilities. Equally important tasks include: systematic training and improvement of employee qualifications in the field of effective implementation, maintenance and continuous improvement of the effectiveness of the quality management system, supporting the activities of other entities conducting activities consistent with the objectives of the Center, as well as entrusting or commissioning other units, in particular those specializing in the area supporting the development of enterprises operating in the field of advanced technologies, performing tasks aimed at achieving quality goals. In the context of research and development projects conducted by the Center, the Center Management and the Project Management Board have an additional role in monitoring the progress of work, ensuring compliance of activities carried out with the assumed project goals and identifying areas requiring possible correction or optimization. These activities are aimed at ensuring high quality and effectiveness of implemented R&D projects, which translates into the Center's ability to generate innovative solutions and strengthen its position on the market as a leading entity in the field of safety, operational analysis and management of hazardous situations in industry.

Ensuring quality control of the Center's activities is crucial to achieving operational success and satisfaction of business partners. The implementation of the described quality control system will allow for effective risk management and continuous improvement of activities, which will contribute to strengthening the Center's position on the industrial market in the field of research and development.

## 6. Discussion

The article presents an example of cooperation between science and industry, showing that it is an important factor for innovation, development and competitiveness of both sectors. The industry needs new technological solutions to manage security and crisis situations more effectively, which can be achieved through access to the latest scientific achievements. On the other hand, science needs the opportunity to test its theories and solutions in real industrial conditions, which is made possible by cooperation with the industrial sector.

The partnership between science and industry allows for the transfer of knowledge, enabling the practical application of scientific research in industry. The creation of the Competence Center at the Silesian University of Technology is an example of such synergy, where the involvement of scientists, students and industry representatives allows for the creation of innovative solutions in the area of security and crisis management.

Cooperation between science and industry is also crucial for the rapid implementation of new technologies, such as artificial intelligence or data analysis, which can significantly improve the efficiency of activities in industry. Thanks to this partnership, it is also possible to better understand the needs and challenges of both sectors and direct scientific research to areas that have real applications in industry.

As a result, cooperation between science and industry is not only beneficial for both sectors, but also for society, by generating innovative solutions, increasing safety, and improving the quality of life. The article therefore emphasizes the importance of this partnership as a key factor supporting the development and progress in the field of security and crisis management.

The practical implications of the article are multifaceted. Firstly, for the industrial sector, they mean the opportunity to benefit from the latest scientific achievements in the area of security and crisis management, which translates into improved operational efficiency and an increase in the level of safety. The creation of the Competence Center provides enterprises with the opportunity to participate in research projects and training that may significantly impact their operations.

For the scientific sector, practical implications include the ability to test theories and practical solutions in real industrial conditions. Partnership with the industrial sector enables scientists to access data and infrastructure, which can speed up the research process and contribute to the creation of innovative solutions.

The article also points to the need for continuous improvement and monitoring of the quality of activities in the Competence Center, which is crucial for maintaining a high level of efficiency and customer satisfaction. Practical implications therefore include the need for continuous improvement of processes, training and monitoring of results so that the Center can effectively achieve its goals and mission.

Beyond the industrial and scientific sectors, the creation of a Competence Center can bring benefits to society by increasing safety and improving the quality of life. Activities undertaken within the Center may contribute to minimizing the risk of crisis situations and a more effective response to them, which translates into greater security and social stability.

Potential problems related to the operation of the Competence Center may include a number of issues, both organizational and operational. Firstly, there may be a problem with obtaining appropriate financial resources for the maintenance and development of the Center. The effective operation of the Center will require significant financial outlays on infrastructure, laboratory equipment, staff training and conducting research and research and development projects.

Another potential problem may be the difficulty in securing suitably qualified scientific and technical staff. The effective functioning of the Center will require the involvement of specialists from various fields, which may be a challenge due to the competitiveness of the labor market and the specific requirements related to conducting research and training in the area of security and crisis management.

There may also be difficulties related to the coordination of activities between the various partners involved in the Centre, including the industrial sector, scientific institutions and public administration. Effective collaboration and coordination of activities can be crucial to the Center's success, but this may be difficult due to differences in organizational culture, partners' interests and priorities.

Maintaining a high level of involvement of partners and stakeholders in the long term may also be a potential problem. Despite initial enthusiasm and commitment, partners may change their priorities and strategies, which may lead to a weakening of commitment to projects implemented within the Center.

## 7. Conclusion

The article presents important implications for the future of safety and crisis management in industry. Creating a Competence Center at the Silesian University of Technology is a step towards the integration of science and industry, which may bring numerous benefits for both parties. The partnership between the academic sector and enterprises will allow for more effective use of the latest scientific achievements in industrial practice, which in turn will contribute to improving safety standards and better preparation to deal with crisis situations.

The analysis of literature and case studies allowed us to propose the structure of the Center and methods of ensuring activity and quality control of its activities. The implementation of modern training programs, simulations of crisis situations and analysis of trends in the field of industrial safety are an important element of effective risk management.

An important aspect is also the use of advanced technologies, such as artificial intelligence and data analysis, which can support a faster response to changing conditions and minimize the risk of crisis situations. Building a safety culture and promoting employee awareness is a key element of the Competence Center's strategy.

It is worth emphasizing that the presented research results indicate the need for further actions aimed at implementing innovative solutions in the area of security and crisis management in industry. The integration of science and industry and the use of advanced technologies constitute the foundations for effective risk management and minimization of the negative effects of crisis situations in industry.

The establishment of the Competence Center is a positive step towards increasing innovation, improving safety and supporting the development of science and industry. Activities undertaken within the Center may have a significant impact on improving operational efficiency and increasing the competitiveness of the Polish industry on both the domestic and international markets.

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