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Application of Digital Training Technologies in Shooting Training – in Preparation for Counteracting and Combatting Terrorist Threats

Abstract

The modern world is full of multifaceted security threats. These threats undoubtedly include terrorist threats. Currently the phenomenon of terrorism is ubiquitous and has become an inseparable element of the modern world landscape. Terrorism is a challenge for entities of the state security system responsible for ensuring public security. Preparation of representatives of entities ensuring security requires actions both at the legal and training level. Conducting effective anti-terrorist activities requires preparation through a training process, which includes training in the use of firearms. The application of modern technologies in the process of shooting training owing to a number of offered functionalities that build, among others situational realism. The above is an important element that supports traditional training, creating in such a way an opportunity and a challenge for public and private research and development units in searching for innovative training tools.

Keywords: terrorism, security, public, anti-terrorist activities, the use of weapons, the process of shooting training, modern technologies, situational realism, virtual simulator, training scenarios, consequences of actions taken, analysis of results

Zastosowanie Cyfrowych Technologii Szkolenia (CTS) w treningu strzeleckim – przygotowanie do przeciwdziałania i zwalczania zagrożeń terrorystycznych

Abstrakt

Współczesny świat jest pełen wielopłaszczyznowych zagrożeń bezpieczeństwa. Do zagrożeń tych niewątpliwie zaliczają się zagrożenia o charakterze terrorystycznym. Obecnie zjawisko

terroryzmu jest wszechobecne i stało się nieodłącznym elementem krajobrazu współczesnego świata. Terroryzm jest wyzwaniem dla podmiotów systemu bezpieczeństwa państwa odpowiedzialnych za zapewnienie bezpieczeństwa publicznego. Przygotowanie przedstawicieli podmiotów zapewniających bezpieczeństwo wymaga działań zarówno na płaszczyźnie prawnej, jak i szkoleniowej. Prowadzenie skutecznych działań antyterrorystycznych wymaga przygotowania poprzez proces szkoleniowy, którego elementem jest szkolenie z zakresu użycia i wykorzystania broni palnej. Zastosowanie współczesnych technologii w procesie szkolenia strzeleckiego jest istotne z uwagi na szereg posiadanych funkcjonalności budujących m.in. realizm sytuacyjny. Powyższe stanowi istotny element wspomagający tradycyjne szkolenia, tworząc tym samym szansę i wyzwanie dla państwowych i prywatnych jednostek badawczo-rozwojowych w poszukiwaniu innowacyjnych narzędzi szkoleniowych.

Використання цифрових технологій навчання у тренуванні зі стрільби – підготовка до протидії та боротьби з терористичними загрозами

Анотація

Сучасний світ сповнений багатогранних загроз для безпеки. Серед них, безперечно, є терористичні загрози. В даний час явище тероризму є всюдисущим і стало невіддільним елементом сучасного світу. Тероризм – це виклик для суб›єктів системи державної безпеки, відповідальних за запевнення громадської безпеки. Підготовка представників організацій, що запевнюють безпеку, вимагає дій як на правовому, так і на рівні навчання. Проведення ефективної антитерористичної діяльності вимагає підготовки підчас навчального процесу, який включає навчання в справі використання вогнепальної зброї. Використання сучасних технологій у процесі навчання стрільби є важливим через низку функціональних можливостей, які будують також ситуаційну реальність. Вищезазначене є важливим елементом підтримки традиційного навчання, тим самим створюючи можливість та виклик для державних та приватних суб'єктів досліджень та розробок у пошуку інноваційних інструментів навчання.

The contemporary world is full of multidimensional security hazards. Those hazards clearly include threats of a terrorist nature. We have witnessed numerous acts of violence against citizens of the European Union Member States, which have been carried out by representatives of the so-called Islamic State. Presently the phenomenon of terrorism is omnipresent and has become an inherent element of the modern world landscape [1, p. 9]. Practically every day we are informed by the mass media of yet another terrorist attack. The presented events are accompanied by information of a bombing, hostage, kidnapping, which are associated by the majority of recipients and by mass media with a terrorist attack [1, p. 9]. Contemporary terrorist attacks are characterised by differentiation in relation to *modus operandi*, and are carried out in different locations by terrorists associated within a single terrorist organisation responsible for their inspiring and preparation. This is a considerable hindrance for the adoption of anticipatory measures by entities of the state security system responsible for counteracting and combating hazards of a terrorist nature. Consequently a presumption may be made that terrorist attacks constitute one of the major challenges for entities responsible for assuring public security.

According to B. Hołyst public security pertains to "all conditions and institutions protecting the life, health and property of citizens, as well as total national assets, regime and sovereignty of the state from phenomena hazardous for the legal order" [2, p. 25]. Hazardous phenomena consist of threats to the security understood as direct and indirect disruptive impact on the state. We may distinguish potential and real hazards, subjective and objective hazards, internal and external hazards, military and non-military hazards, crisis and war hazards, as well as intentional and accidental hazards [3, p. 248]. Full elimination of the risk of occurrence of given events is impossible, regardless of the field of public life, which may violate security. Consequently taking the above into consideration, as well as the variability of the reality that surround us, it is hard to accept the definition of security as a state with no hazard, state of peace and certainty [4, p. 18].

Preparing representatives of particular entities of the state security system requires the adoption of measures both in the legal and training dimensions. At this preliminary point of this paper it should be emphasised that pursuant to Article 7 of the Constitution: "Public authority bodies operate on the basis of legal regulations and within it" [5, art. 7]. The legislator has indicated that the use of firearms takes place according to principles specified in the act of 24 May 2013 *on measures of direct coercion and firearms* (Polish Journal of Laws/Dz.U. from 2013 item 628) by an authorised person. Persons authorised to use and apply firearms and measures of direct coercion comprise officers of the Internal Security Agency, Intelligence Agency, National Security Agency, Customs and Revenue Service, Central Anti-Corruption Bureau, inspectors and staff of the treasury inspection, guards of the National Hunting Guards, the National Fisheries Guard, Police officers, officers and soldiers of the Military Counterintelligence Service, functionaries of the Prison Service, officers and soldiers of the Military Intelligence Service, commune (municipal) guards, officers of the Border Guard, guards of the State Forestry Corps, guards of the Speaker's service, functionaries of the Railway Police, officers of the Park Guards, soldiers of the Military Gendarmerie or of military law enforcement entities, security staff authorised to the adoption of direct coercion or firearms pursuant to regulations of the act of 22 August 1997 *on protection of people and property* (Polish Journal of Laws/ Dz.U. from 2005 No. 145, item 1221, as later amended), inspectors of the Road Transport Inspection Centre [6, art. 2].

The objective of adopting the above mentioned authorisation is to enhance the effectiveness of measures adopted by empowered entities of the state security system in a situation of counteracting and combatting hazards, also those of a terrorist nature, concurrently assuring legal safety to entity representatives anticipated in the act. Concurrently the authors of the analysed solution emphasise the necessity of maintaining due care related to conduct in these types of cases and indicate that firearms should be used in the least harmful way [6, art. 7 par. 1]. Before using firearms the authorised person has to take up measures related to identification of his formation or service by shouted warning and command of the given person to act according to the law, and in particular to immediately drop the gun or another hazardous object, the use of which may threaten the life, health or freedom of the authorised person or another person, cease running and withhold from violence [6, art. 48 par. t 1. item 1 and 2 a, 2b, 2c]. In case of non-compliance with the warnings, the authorised person is to provide a warning in the form of a shout about the intention of using firearms, and if the command is ineffective – a warning shot is given in a safe direction [6, art. 48 par. 2].

Preparing entities of the state security system to counteracting and combatting terrorism requires multidimensional training process [7, p. 155], which is based among others of training in the use of firearms as a specific and effective means of direct coercion. The objective of the training is to achieve the desired competencies and deploying them in practice by way of appropriate allocation in the structure of anti-terrorist operations. The variability of the hazard environment of a terrorist nature requires finding new solutions that would allow becoming adapted to the actual circumstances [7, p. 159]. And this type of adaptation depends among others on the available information concerning the potential hazard or the acquired training level of the functionaries.

The objective of this paper is to describe the functionalities of Digital Training Technologies (CTS) in the shooting training available to representatives of the state security system entities, which carry out tasks related to counteracting and combatting hazards of a terroristic nature. The combatting of terrorist hazards requires multidimensional preparation, also in the scope of skilful use of weapons consistently with legal regulations. Given their unpredictability and variability, terrorist hazards pose a challenge for representatives of entities comprised by the state security system also with respect to selecting appropriate means of direct coercion. Building the situational awareness, which is indispensable for an assessment of the hazard situation, constitutes a key element that allows appropriate choice of means and ways of its application, and training in this respect is also enabled by modern technological solutions, such as the Digital Training Technologies (CTS).

The use of firearms is connected with taking of a decision by the authorised functionary, which is usually done under the pressure of time and in a clearly stressful situation. Compilation of information in a short time and its correct interpretation make possible working out and adopting measures consistent with legal requirements. Information (lat. *informatio*) means understanding, image or concept. This applies to news, rumour, novelty, anything that is communicated, notification, communication, advice, notice, conveying a message, data, and measure of knowledge about a specific event [8]. The dictionary of contemporary Polish [9, p. 320] defines information as an element of knowledge passed on using language or another code, which constitutes a factor that enables reducing the degree of ignorance related to a certain phenomenon, and that allows an individual to enhance his familiarity with the surroundings and more effective execution of the planned task [10, p. 176]. In case of potential hazards having at disposal intangible resources in the form of information may prove to be an advantage. Counteracting terrorist hazards depends on mastered knowledge, the

so-called intellectual capital [11, p. 101], understood as information organised as a conceptual reality model [12, p. 5]. The Cambridge International Dictionary of England defines knowledge as: comprehension or obtaining information on the given subject, which had been gained as a result of conducted experiment or study, and which has been compiled in a human brain or generally available to the people.

According to the port-modernistic school, our knowledge is a simple refection of something that does exist but which is at the same time a set of compiled facts, a reflection of everything we do [13]. Alvin Toffler, the American futurologist known for his works related to the digital revolution, specified four characteristic features that distinguish knowledge from the remaining traditional resources:

- domination – knowledge occupies a priority position among the remaining resources and is of strategic importance for the functioning of each entity;
- inexhaustibility – the value of knowledge resources is not decreased when it is passed on;
- simultaneity – knowledge may be used at the same time by many persons, in different locations;
- Non-linearity – absence of clear correlation between the volume of knowledge resources and the ensuing advantages [14].

It should also be added that according to available literature knowledge may occur in two forms:

- descriptive form – this form enables describing the reality, because it comprises typologies, descriptions and categories;
- prescriptive form – this form occurs as database that contains "the best practices" of the "most frequent questions with responses" – FAQ [15, p. 40].

Assuming the division of knowledge with respect to its localisation or the empowerment of the knowledge holder as a criterion, the following two groups may be distinguished:

- individual knowledge – pertaining to an individual, ascribed to a specific person, compiled in its mind, and lost when this person quits the formation;
- organisational knowledge – pertaining to a group, compiled in principles, joint standards [16, p. 155].

The above is strictly correlated to the reality that surrounds us, based on knowledge[1], value understood as a capability of mastering, comprehending, learning, creat-

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1 Around 1800 the time necessary to double knowledge of the population was ca. one hundred years, currently this period is no longer than 5 years. The pace at which contemporarily new knowledge is created may be observed by acknowledging the number of innovations that appear in the world that surrounds us. On average every minute a new chemical formula is beng worked out, and

ing new solutions based on the compiled data and information [11, p. 101]. Given the dynamically changing terrorist hazards, importance is gained by the ability of adapting to the specific situation, with the use of knowledge and contemporary technologies developed by it. An example of synergy in the use of knowledge and technology may be constituted by training simulators for practical learning of the use of firearms, including legal aspects of their use. For the needs of the present paper, dedicated to the application of contemporary technologies in the process of anti-terrorist training, selected elements of technologies will be presented, which given their functionality may be applied in the training process.

Training of the authorised person[2] at a model level requires preparation at different levels. Starting with multi-level training through specialist training, as well as refresher and updating training. The training process takes into consideration four elements, and namely knowledge, skills, habits and reflexes. Fig. 1 shows a model of achieving different training levels.
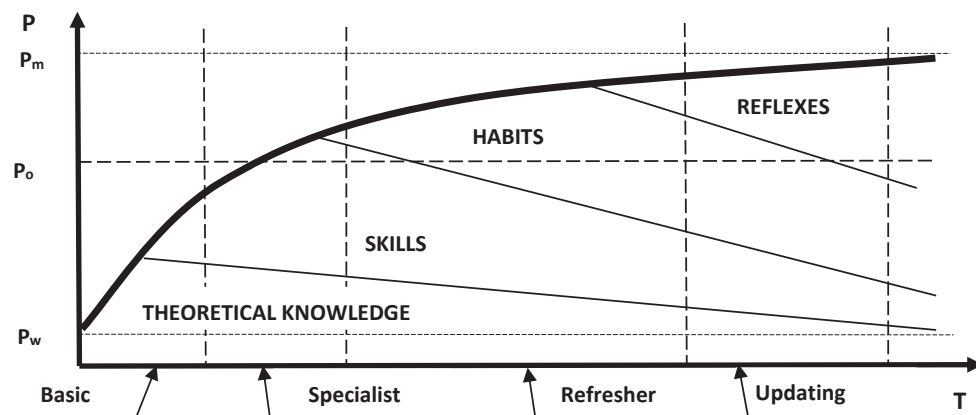
Fig. 1. Model of achieving educational levels

P – education level (Pw – initial level, Po – anticipated level, Pm – model level), T – time of training implementation

Source: [17, p. 144]

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every 3 minutes a new physical dependence is rcorded. W. Marotzki, *Manuskript zur Vorlesung*, Einfuhrung in die Allgemeine Padagogik 1999.

2 Art. 2.1. of the act of 24 May 2013 on *direct coercion means and firearms* (Polish Journal of Laws/ Dz.U. from 2013 item 628) defines the catalogue of entities in the state security systems, the functionaries of which are authorised to the application of direct coercion means and firearms.

Both in the educational process and during the combatting of terrorist hazards, the safe and effective usage of firearms is an indispensable ability of the authorised functionary. The correct usage of acquired skills, regardless of the complexity of situations and conditions, is a guarantee of effective neutralisation of the given hazard. As has already been mentioned, the behaviour of the authorised functionary who is using firearms, must conform to legal requirements, i.e. it has to be preceded by the necessary assessment of the situation, deciding whether to use of firearms or not, preceded by correct recognition and selection of target. One of the training elements is an attempt at enhancing the acquired skills and gaining new ones by repeating and modifying exercises in the training process [18, p. 94]. Training delivered in such a way, extended by an analysis of the obtained results, drawing of conclusions and their deployment in successive training step, allows achieving the shooting model training levels [19, p. 128].

The contemporary technological development allows supporting the training process by deploying innovative solutions also for needs of training. The development of technologies in the scope of IT and communication technologies[3] (ICT) allows developing digital training technologies for functionaries within a wider scope of competencies, maintaining situational realism as an indispensable training element [20, pp. 126–127]. The concept of classical training units that allow manual execution of certain activities is increasingly frequently replaced by a complex approach, which makes it possible to train a person authorised to work as functionary in difficult conditions. Complex training comprised both manual elements, as well as legal basis of the usage of firearms, creating a suitable dimension for the adoption of technical solutions that extend the training process by elements not available if traditional methods are applied. Digital Training Technologies (CTS) enable training of individual skills of functionaries related to the use of firearms. The principal advantages of using CTS in the training process comprise the following [20, pp. 126–127]:

- possibility of performing a multimedia introduction to the thematic scope of the training [21, pp. 229–239];

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3 Information and Communication Technologies (ICT) – all measures related with the production and usage of telecommunication and IT devices and services that accompany them, as well as the compilation, processing and providing access to information in electronic form based on digital techniques and all tools of electronic communication.

- possibility of delivering training on the basis of diversified drill scenarios, adapting the training environment to the required difficulty level;
- possibility of delivering training based on scenarios which are too complex in the traditional training;
- possibility of multi-use of prepared training materials and exercise scenarios;
- possibility of monitoring the course of the training process [22, pp. 123–136] and executing an analysis once the training is completed;
- possibility of delivering training related to evacuation from the scene of the incident and to providing first pre-medical aid after the use of firearms;
- possibility of compiling information concerning individual progress of training participants;
- possibility of compiling information concerning the ways in which trainees move around during drills [23, pp. 337–346];
- possibility of dynamic changes to the training methodology depending on actual training needs;
- supporting the instructors by automation of certain routine activities during the training;
- optimising costs of logistic preparation of trainings and reduction of operating costs of the training infrastructure;
- possibility of developing new training methodologies making use of the CTS functionalities [24, pp. 1057–1064],
- assuring objectivism of the assessment and accountability of the training process.

The application of modern technologies in the shooting training is an important element that supports the work of instructors, whose task is to devise scenarios for trainings in conditions similar to real ones. CTS-based solutions allow the possibility of generating a realistic hazard in the simulation environment, in which the trainees have to prove their interdisciplinary competencies [24, p. 130]. The adoption of such solutions by introducing the trainees into a virtual environment that is characterised by situational realism allows them to experience and cope with consequences of own actions and those of the entire group, teaching them cooperation. It is vital that during the training use is made of weapons used in the service – ascribed to a training participant, because this has a direct impact on maintaining the situational realism.

Fig. 2 presents an example of a multimedia trainer for needs of trainings in the use firearms, maintaining a high degree of situational realism.

Fig. 2. Multimedia Shooting Trainer with a high realism level
Source: [20, p. 130]

The trainer is an example of a tool that assists shooting training extended by elements that enforce that make it necessary to maintain situational awareness at all times during the practical execution of tasks, for which the assumption would be the use of firearms. Making use of functionalities offered by the CTS system, the instructor may request a trainee executing a shooting task to provide legal justification for the undertaken measures. Such justification is evaluated during an analysis carried out by the instructor. Thanks to several functionalities of the virtual environment the instructors may create tasks with a variable difficulty level such as for example shooting in changes of distances of shooting targets, consequently defining the specific nature of the drill being executed. Making use of the extended trainer functionalities, the shooting training may be carried out in various thematic scopes, enhancing shooting competencies of the authorised person. The following may be categorised to example areas [24, p. 132]:

- practical execution of tasks related to the usage of arms and equipping by the authorised person;
- cooperation in the execution of complex tasks on locations associated with terrorist acts;
- enhancing competencies with regard to correct application of binding legal acts and procedures;
- adoption of measures in situations involving hostages, referring to the defining counter-terrorism actions[4];
- execution of tasks involving a large number of people in the location where operations are carried out.

Apart from the above specified aspects, the practical application of virtual shooting simulators allows achieving several functional possibilities, such as for example:

- possibility of shooting drills with the use of combat [25] and laser weapons;
- possibility of creating a repository of pre-defined scenarios of shooting tasks;
- possibility of using tools that make it possible to the instructor to configure human shapes and locations on his own (configurator of locations, configurator of facilities, configurator of persons, configurator of scenarios);
- possibility of gaining access to the repository of people with a high realism degree, with maintained facial expressions and taking into account the anatomic reaction of the body to being hit from a firearm;
- high-quality repository of facilities and locations obtained with the use of inter alia photogrammetric techniques[5];
- possibility of integration with typical elements of training infrastructure prevailing on military firing ranges, such as for example strobe lamps, fumitories, lighting and ventilation to simulate changing conditions of the training environment;

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4 Art. 2 of the act of 10 June 2016 *on anti-terrorist actions* (Polish Journal of Laws/Dz.U. from 2019 item 796) defines counter-terrorism measures in the following way – *this should be understood as measures adopted in relations to perpetrators, persons preparing or abetting in committing of a crime of a terrorist nature as specified in art. 115 § of the act of 6 June 1997 – The Penal Code (Polish Journal of Laws/Dz.U. item 553, as later amended), conducted to eliminate a direct hazard to the life, health or freedom of persons or property with the use of specialist forces and means and a specialist operating tactics*

5 **Photogrammetry** – field of science and technique oriented at the reconstruction of shapes, dimensions and mutual situation of objects in the actual terrain based on photogrammetric photos (photograms) Source: [26]

- possibility of integration with a set of shooting mannequins and medical and evacuation items;
- access to the database system (DBMS or SBD)[6] compiling information important for shooting trainees and enabling interactive verification of knowledge in the scope of binding law and procedures;
- access to the a set of stands and programming tools that allow the reproduction of the face of a given person and role playing, among others to enable the execution of practice related to negotiation techniques;
- access to a set of tools meant to enable a review of conducted drills and drawing conclusions for the future (so-called *After Action Review*), which allows monitoring [26, pp. 69–76] and visualisation of the targeting path;
- execution of ballistic calculations [27, pp. 195–228] with the use of the physics engine[7], to allow making simulations, for example of variable weather conditions.

What is more, owing to the application of modern technological solutions, the analysed tool that makes use of a virtual training environment helps reduce operating costs of the training infrastructure in relation to traditional trainers. This is possible not only thanks to the unlimited accessibility of training scenarios, but also with view to the countability and scalability of this system, and that contributes to the optimising of operating costs by applying for example coloured calibration or the application of laser or pneumatic shooting. Training executed with the use of laser or pneumatic weapons has a positive impact on maintaining the security level of trainers and instructors, especially at the level of elementary training. The functionalities of the virtual shooting training simulator make it possible to the instructor to select shooting tasks of a varying difficulty level, in such a way impacting the constant behavioural pattern of the authorised person, which is of considerable importance in working out correct habits and reflexes.

The use of firearms by the authorised person as a constant element of the execution of tasks related to counteracting and combatting of terrorist threats requires a last-

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6 Database Management System, DBMS) – software or an IT system used to manage the database. The database management system may also be a data base server (SBD) or it may allow access to the database locally – on a given computer.

7 The type of software used for simulating the laws of physics in video games, films and scientific models. The physics engine is Responsible among others for changes of movement trajectory and detection of collisions of solids, deformation of elastic bodies and fluid dynamics. Source: [28]

ing and differentiated training process. The training is to be oriented at achieving a model-level preparation for the execution of tasks in the scope of counteracting and combatting terrorist attacks. To recapitulate deliberations concerning issues of using modern technologies in the process of anti-terrorist training it should be emphasised that the application of digital technologies has a positive effect on the process of shooting training of the authorised entities. Those advantages are expressed by the elimination of unjustified risk related to maintaining optimum safety, both of instructors and trainees. The establishing of training scenarios based on real conditions allows achieving situational realism, which is transposed on the psychological context of training participants who experience stress arising from a critical evaluation of the situation and the necessity of acting in a simulated place of terrorist attack with a limited access to information. Deliberations performed in the paper have made it possible to define a set of essential functional requirements for tools meant to assist the instructors delivering training related to the use and application of firearms during anti-terrorist actions. The above functionalities of the virtual shooting simulator, as discussed in the paper, may offer a chance and concurrently a challenge for state and commercial research and development centres with respect to developing modern training tools based on digital technologies. When such tools that are based on modern technological solutions that allow modification depending on actual needs are used in the shooting training process, they will certainly constitute an additional element contributing to achieving a model training level. In pursuit of justification to such presumption it should be emphasised that the combination of a realistic environment where actions are adopted in relation to terrorist hazards, the so-called situational realism with unlimited possibilities of creating diverse training scenarios taking into account legal conditions and consequences of actions taken are a response to training needs arising from the complex nature of situations, which are a constant feature of terrorist threats. Yet at the same time it should be considered that virtual shooting simulators would not be able to replace training with the use of real infrastructure (buildings, training grounds), nevertheless they enable repeatable training in conditions similar to real ones, reducing training costs and permitting the instructors to raise the difficulty level of the training. Furthermore, taking into consideration growing infrastructural needs of services that combat terrorism and the prevailing trend of developing of training infrastructure with the aim of boosting competencies of representatives of entities of the state security system, it may be presumed that the adoption of contemporary technologies will have a positive impact

on the level of interdisciplinary shooting training and consequences of actions taken, which is considered an important element in becoming ready to handling and combatting terrorist threats.

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nauki o polityce. Rozprawę doktorską obronił w Akademii Humanistycznej im. Aleksandra Gieysztora w Pułtusku. Absolwent Warszawskiej Wyższej Szkoły Biznesu, gdzie uzyskał stopień Master of Business Aministration. Od 26 lat jest funkcjonariuszem Biura Ochrony Rządu, obecnie Służby Ochrony Państwa w stopniu podpułkownika. Pracownik naukowy na stanowisku adiunkta Wydziału Humanistycznego Akademii Finansów i Biznesu Vistula. Jego zainteresowania naukowe skupiają się na dwóch obszarach. Pierwszy dotyczy problematyki związanej z funkcjonowaniem podmiotów systemu bezpieczeństwa Rzeczypospolitej Polskiej realizujących zadania w obszarze przeciwdziałania terroryzmowi i zwalczania go. W tym obszarze misją jest poszukiwanie praktycznych rozwiązań w zakresie profesjonalnego funkcjonowania formacji zapewniających ochronę przedstawicielom organów władzy. Drugi obszar poświęcony jest problematyce szeroko rozumianego bezpieczeństwa osób prawych i jednostek posiadających zdolność prawną. Jego misją jest poszukiwanie rozwiązań organizacyjnych w zakresie szacowania ryzyka i tworzenia skutecznej polityki bezpieczeństwa organizacji. Członek Rady Naukowo-Technicznej Ministra Spraw Wewnętrznych opiniującej propozycje projektów naukowo-badawczych i badawczo-rozwojowych z obszaru „Bezpieczeństwo i Obronność" realizowanych na rzecz formacji nadzorowanych przez Ministra Spraw Wewnętrznych.