

CROWD MANAGEMENT DURING MASS EVENTS

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Abstract

Mass events organized in Poland in recent years, including sports, entertainment, as well as cultural and social (religious) gatherings, have been consistently gaining popularity, as reflected in the large number of participants. This is undoubtedly due to the attractiveness of the events on one hand and the positive assessment of the safety level during these events on the other. Yet it is crucial to recognize that beyond their positive aspects, mass events frequently present specific challenges and threats. Unpredictable and irrational behaviour among participants can result from a variety of factors, posing risks to their health and lives as well as that of bystanders and property. Effective managing of these situations is a genuine challenge for governmental authorities, services and responsible entities. This challenge stems from comprehensive preparatory and organizational measures designed to prevent crisis situations and, if they occur, promptly regain control. This study aims to present a model of organizational-procedural solutions and explore the application of modern information technologies to enhance participant safety during mass events. The research methodology involved a comprehensive analysis of scientific, industry, and legal materials. Additionally, valuable insights were drawn from the author's first-hand experience gained through direct observations while fulfilling official duties in ensuring the safety of mass events during real incidents in Poland.

Keywords: safety, crowd, the Police, management, threats

1. Introduction

One of the characteristic features of contemporary societies is their mass nature. Almost every day, people have to function in the presence of strangers in enormous crowds. Being in large groups in a specific place and time is sometimes inevitable, for example, during mass events such as sports competitions, cultural and entertainment events, social protests, or various national and religious ceremonies. These events take place in sports and entertainment venues, tourist and recreational centres, shopping facilities, places of mass religious worship, as

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well as public spaces, where such events can either be stationary or dynamic – moving along a designated route.

These voluntarily assembled, temporary congregations can attract varying participant numbers, ranging from hundreds to hundreds of thousands. They constitute spontaneous, emotionally charged, easily aroused crowd capable of unpredictable behaviour and susceptible to accidental or intentional destruction (Wren, 2005).

The unifying factors among participants, shaping the crowd's dynamic character, include ideology, economy, politics, ethnic origin, religion or a desire for entertainment. Participation in such events provides an opportunity for knowledge enrichment, exchange of experience, expression of views, communication, prayer, observation of various shows or performances, creating a sense of belonging to a community, and, in a way, freeing people from social divisions. Participants form a unity where one's origin or social status is irrelevant.

Despite their individual differences, mass events share common traits arising from the similarity of participant behaviours. Individuals in these events act similarly, experiencing identical situations and emotions. These gatherings attract loosely organized groups with common objectives, and under certain conditions, these groups transform into a crowd.

A crowd may be characterized as a transient assembly of a substantial number of people in a space that allows direct contact, reacting spontaneously to the same stimuli in a similar or identical manner. Key crowd characteristics, such as size, anonymity, a sense of belonging, strength and perceived impunity, significantly influence its dynamics. These factors may diminish the sense of responsibility for acts condemned by society, which are often antisocial and illegal (Białowąs, 1976). Under intense excitement, crowd participants may lose rationality and respect for the law, uniting in collective action when they perceive a threat to shared values (Kosiński, 1987). The lack of organization, weakened norms, fascination and emotional contagion in the crowd contribute to destructive behaviours, including demoralization and brutalization (Sołoma, 1991). People in a crowd exhibit behaviours distinct from other contexts, becoming bolder, taking risks they would avoid individually, leading to a lack of inhibition, such as pushing, vandalism and street riots.

While locally organized mass events may not require specific security measures, those with a broader scope, popularity, significance or international dimension increase the potential number of threats that may impact their course. This necessitates the implementation of well-coordinated organizational actions, involving special competencies, experience and collaboration (Gorczyński, 2021) on the part of all parties concerned – government authorities, services, entities responsible for their proper conduct (including organizers), and participants alike.

2. Methods

The aim of the study is to present a model of organizational-procedural solutions and explore the potential use of modern information technologies to ensure the safety of participants in mass events. Noteworthy among the methods adopted is the research method involving qualitative analysis of scientific, industry and legal materials. This involved organizing and terminological interpretation of the content to achieve the research objective. Valuable insights were also drawn from the author's experience, stemming from direct observations during the execution of official tasks related to ensuring the safety of mass events in the course of authentic incidents in Poland. Observations focused on the organizational process and implementation of security measures during mass events, including participation in training sessions at national and international police training centres. The observations primarily aimed to acquire new scientific facts regarding crowd management methods. The presented procedural model can provide knowledge for the efficient preparation of entities responsible for safety in subsequent similar events that occur periodically. Fundamentally, the research did not aim to develop a new scientific theory but rather to leverage the existing expertise of individuals representing the discipline of safety sciences in addressing the socially significant issue of mass event security.

3. Results

The effective security management of mass events involves the implementation of systematic solutions, involving the fulfilment of numerous procedures and extensive preparations. These preparations are crucial prerequisites for ensuring the seamless coordination of actions and the ability to execute effective interventions when necessary.

Securing mass events involves implementing systematic solutions, including fulfilling numerous procedures and extensive preparations. These preparations are essential for ensuring efficient coordination of actions and effective interventions should a need arise. Ensuring the security of a mass event directly translates into effective crowd management. Crowd management essentially comprises a set of cooperative practices, a series of coordinated efforts involving various entities. These efforts aim at proper preparation (planning), organization (logistically secured and marketing-presented), execution (implementation) and control of events that involve large gatherings (Challenger et al., 2009). It comprises activities aimed at reducing potential threats, contributing to the smooth and unproblematic movement of the crowd, preventing threats and maintaining control (Reiman, Rollenhagen, 2011).

Crowd management primarily relates to the preparation for a specific event, involving anticipating and preparing for the design of desired crowd behaviour and predicting potential problems (Wijermans et al., 2016).

A crucial element of effective crowd management is planning, influencing further actions. Planning is a conscious process of establishing directions and making decisions based on goals, facts and well-thought-out assessments. The goal of planning is to determine the sequence, methods and deadlines for task execution, solving problems of cooperation and coordination during actions.

The basis for planning is the identification of specific risk areas, factors and conditions likely to occur at a given time and area affecting task execution. This information allows a detailed analysis and evaluation of all factors influencing their execution, including the location of objects or places and their organizational-technical solutions. Urbanization degree, proximity of buildings requiring special protection, terrain configuration, access to grocery stores with alcohol, the presence of bridges, walkways over roads, as well as the possibility of using technical equipment are also relevant. Additionally, places that provide opportunities to obtain resources to confront law enforcement agencies (Struniawski, 2018).

Information gathered about individuals or groups should concern their ideologies, values, attitudes, intentions, possession of dangerous materials or tools, possible behaviour and reactions. This knowledge helps understand group interests and goals, facilitating the achievement of legal goals. Accurate identification of potential threats allows swift and effective action.

Planning for threats should consider the “worst-case scenario,” encompassing the occurrence of all, even the least probable, threats. Plans should address the possibility of events that could happen, even if they have never occurred in similar circumstances. Based on predicted threat scenarios, action variants are developed, outlining one of the possible ways to execute the task. The number of variants depends on the knowledge of predictions regarding the aspects of interest at the time. Tasks are then assigned to specific entities.

Plans should be prepared individually for each specific event. When held cyclically, templates and solutions previously used, even if they yielded positive results, should not be duplicated or imitated. It is crucial to remember that good results were achieved in the past under specific conditions, and each new situation has its unique characteristics and properties.

Organizing mass events involves preparing appropriate conditions for the execution of tasks. As part of the organizational activities for mass events, organizers should adequately prepare the infrastructure of the venue or area (organizational-technical solutions) where the event will take place. This includes spatial architecture, monitoring systems used to control human behaviour and traffic engineering solutions, as well as fire protection. Ensuring participants' safe entry, participation, and exit from the event site are essential.

Appropriately prepared and equipped venues for mass events help reduce the risk of undesirable behaviour by their participants. Organizers' responsibilities in this regard involve ensuring compliance with building standards for the technical condition of the venues, including the installations and devices serving these facilities. These installations and devices are designed to counter potential

threats to event participants, primarily enhancing the effectiveness of combating hooliganism and undertaking preventive actions. They serve as tools to monitor order in sports facilities and their immediate surroundings, facilitating a faster response from security and police services. Their role also includes effective monitoring of all areas and activities to allow immediate detection of fires, emergencies and other threats. They integrate all security, communication and protection solutions within the facility management system, supporting a quick and controlled evacuation if necessary.

Venues for mass events should be connected by functional roads for needs of individual traffic and, if possible, have convenient access to public transport (from the city centre, main railway station, bus station or airport). It is not advisable for access roads to interfere with the paths of entry and exit and with evacuation routes. Furthermore, when organizing mass events, changes in traffic organization should be taken into consideration, such as planning detours, adjusting the schedule and route of public transport, designating parking areas and providing additional public transport for participants. Simultaneously, efficient access for municipal and rescue services to the event location should be ensured. Moreover, organizers should provide parking spaces for various target groups, including participants, athletes, judges and VIPs. Proper setting up of these parking areas, including lighting and clear signage, contributes to the efficiency of crowd flow management, especially when an event attracts significant interest, and minimizes the risk of hazardous situations.

In response to the growing risk of terrorist threats, the use of specialised technical measures such as mobile fences, barriers, posts, concrete barriers and blockades is increasingly common (Dorreboom, Barry, 2022) in close proximity to areas where people congregate. The objective is to prevent the entry of mechanical vehicles into crowds and thwart their potential use for transporting and detonating explosive materials (Struniawski, 2018). These barriers also serve purposes such as dividing the crowd into smaller, more manageable groups, guiding people to exits and entrances, facilitating orderly queues, creating routes and detours to prevent congestion in specific areas like gates or corridors. Additionally, in anticipation of threats associated with the use of weapons of mass destruction, specialized gates—radiometric for detecting hazardous materials, metal-detection gates, checkpoints for identifying mines and explosives before entering the event area or other specialized equipment for recognizing specific threats—should be utilized.

A crucial component of the security system for enclosed facilities, such as stadiums (sports venues), is the access control system coupled with verification of entering individuals and documenting their passage. Visual monitoring is, among other things, a tool that enhances the chances of detecting crimes and offenses at the time they occur. The mere awareness of ongoing registration effectively influences the mindset of participants, dissuading potential troublemakers from committing unlawful acts. For open events, the use of mobile CCTV (close circuit television) centres is recommended that should serve as a management centre. Unmanned

aerial vehicles and helicopters equipped with cameras are used for detailed crowd monitoring. Real-time video material helps analyse the current situation, manage the crowd, detect movement in restricted-access areas and estimate crowd density in critical locations. This capability proves invaluable for approximating crowd numbers, evaluating density along specific routes, and facilitating decisions regarding alterations in direction or the activation of designated waiting areas (Kanaujiya et al., 2022)

Proper labelling of facilities is also important. Signage should include evacuation routes, exits and evacuation directions, locations of fire protection equipment and extinguishers, locations of fire switchgear, main gas installations and fire hazardous materials. Information about the location of keys to emergency exits should also be provided.

Active communication is conducted as part of organizational activities, enabling the establishment of relationships based on participants' trust. It can also be an important preventive and de-escalation tactic, providing a basis for future conflict avoidance. Meetings are organized a few days before the mass event involving representatives, primarily from the police, the State Fire Service, the organizer and substantive organizational units of the municipality. Clarifying the expectations of all parties at the outset aims to facilitate the smooth organization of the event, ensuring its safety, and allows for the prevention of unnecessary misunderstandings in the future.

After the completion of planning and organizational activities, the implementation phase begins. Implementation involves monitoring crowd activity to identify potential issues and undertaking necessary interventions.

In Poland, the responsibility for the safety of mass events lies primarily with the Police, except for cases where event organizers are legally designated to ensure safety during such an event. Police tasks related to securing mass events begin several hours before the event, focusing on reconnaissance, crime prevention and information gathering. Activities are concentrated on securing the immediate vicinity of the event, monitoring assembly points, supervising main transport routes, including participant access routes, public transport routes and private transport. This also involves overseeing destination areas, railway stations and designated parking areas for buses.

At this stage of security measures, a continuous assessment of the crowd's condition is conducted, scenarios are evaluated, and potential threats at an early stage of their development are identified. On the other hand, the organizer of mass events held in facilities or areas with pre-designated zones should ensure an efficient organization of participant entry. To achieve this, an appropriate number of information services or volunteers should be designated, along with clear event regulations and efficiently functioning deposit points.

Once a mass event begins, Police actions must ensure that it runs smoothly, balancing the highest safety standards with minimal interference in the personal freedom of participants. Achieving this involves psychological influence on the crowd, using video equipment demonstratively to remove the participants' sense of anonymity, inducing feelings of fear, uncertainty and shame.

Crowd management is crucial during incidents of crowd panic, defined as a sudden and unexpected outbreak of intense and rapidly spreading collective fear, leading to a violent escape. Factors contributing to panic include a large concentration of people in a small space, being taken by surprise by a strong and unexpected stimulus (such as sound, scream, collapse of a building structure, fire incident, lack of visibility), perceiving rapid escape as a chance for survival, lack of accurate information about the incident, limited access points and rumours. Ultimately, it causes greater damage and losses, including loss of life, than the negative impact factors themselves. In such a situation, the task of safety services is to conduct a swift evacuation of individuals at the event location to a relatively safe place (Gromek, 2017). This involves directing people to the appropriate evacuation exits, guiding individuals with disabilities to designated areas, and continuously monitoring their positions, indicating alternative evacuation routes in case the primary evacuation route is unavailable. The role of the coordinator and, in the case of a mass event, the announcer is crucial in calmly and logically providing participants with necessary information to ensure a safe and rapid exit from the venue.

Another Police strategy influencing crowd management involves actions taken within established conflict prevention teams. These teams monitor potential areas prone to conflict situations and assist in resolving them without resorting to police forces or any forceful means. Their goal is to control negative emotions among participants, often influenced by alcohol, to prevent disturbances in public order.

However, when warning actions prove ineffective and participants show no signs of compliance, leading to the violation of the law, the Police are obligated to restore public order. This transition from proactive crowd management to reactive crowd control involves changing the model of actions, shifting from ensuring safety to controlling the crowd (Scheme No. 1). Measures aimed at ensuring public safety and restricting negative behaviours are implemented, and in cases where there is a threat to public order, dispersal actions are undertaken. These actions involve direct and decisive reactions by police units, focusing on breaking down the crowd, displacing its parts in specified directions, and arresting the most aggressive participants. Police intervention should be in response to illegal actions rather than preventing them. This process is implemented as a last resort when the crowd is out of control, and the event is not proceeding according to the established plan.

Scheme 1. Police Actions — transition from peaceful measures (proactive — crowd management) to forceful measures (reactive — crowd control)

Crowd Management (Peaceful Solutions)	Crowd Control (Forceful Solutions)
Low “level” of engagement	High “level” of engagement
Covert Police presence	Demonstrative Police presence
Gradation of impact measures	Early use of force
Classification of tolerated behaviours	No defined negative behaviours, no tolerance
Ensuring safety	Elimination of threats

Source: Own compilation

Police actions related to securing mass events carry the risk of perceiving and treating all participants in the same way. The use of force against the entire crowd should be avoided, especially when a small number of individuals pose a threat to public order. Failure to adhere to this principle can lead to conflicts and the escalation of tension, resulting in negative behaviour from peacefully oriented participants. Individual incidents of negative behaviour should not be the basis for interrupting or terminating the event and imposing radical restrictions on other participants. Police actions, involving the effective identification of individuals within the group and the swift isolation of those who may disrupt public order from those who are peaceful, allow gaining respect and support from other participants in the mass event (Scheme No. 2).

After the conclusion of a mass event, there is a phase of disengagement aimed at restoring the “normal” (original) state. This involves protective and orderly actions, primarily ensuring the safety of participants as they disperse along designated routes.

At every stage of securing mass events, control activities are carried out. Control measures during mass events are intended to verify whether the obtained partial results of actions allow reaching the final destination within the specified time (Griffin, 2001). The course of control should be thoroughly analysed to clarify any irregularities or ensure proper functioning. The analysis also aims to address anomalies, attempts to eliminate them and propose solutions for better organization.

Understanding crowd behaviour and how to efficiently and effectively manage it is a collaborative effort that spans various scientific fields, including theoretical physics, sociology, psychology, computer science and artificial intelligence. Technological advancements increasingly support crowd management operations (during event planning and implementation) worldwide. Created tools provide a comprehensive description of the crowd, maintain the level of security, predict threats and suggest actions based on decision support systems. These solutions

Scheme 2. Principles of Crowd Management

Communication	<ul style="list-style-type: none"> • Informing, open dealings with all participants (disruption of internal communication systems)
Enhancement	<ul style="list-style-type: none"> • Preventive approach - not repression; • Police strategy and tactics should consider the intentions of participants, as long as they remain calm (peacefully oriented); • Communication with participants - explaining the reasons for specific police actions and the imposition of restrictions, as well as alternative measures that could be taken; • Types of tolerated behaviour should be clearly defined and communicated in advance; • Active communication with participants; • Creating a friendly atmosphere and avoiding potential conflicts.
Diversification	<ul style="list-style-type: none"> • Treating participants who pose an actual threat differently from those who do not create problems; • It is inappropriate to act against the entire crowd unless there is evidence that the crowd as a whole poses a threat to order; • Massive use of force may contribute to the escalation of the level of threat to public order through interaction with the dynamics of the crowd.
Balance	<ul style="list-style-type: none"> • Maintaining balance between the police engagement style, the level and source and the nature of the risk; • Graduating security measures and the possibility of applying a direct response in case of intensification in the level and change in the nature of the risk; • If balance is achieved, most people in the crowd are likely to perceive police actions as appropriate, and therefore, they are less inclined to support those seeking confrontation.

Source: Own compilation

include computational models and automated tools such as lasers, radio-frequency identification (RFID), artificial intelligence (AI), automatic recognition and machine learning (ML), infrared cameras (FLIR) and mobile devices (e.g., Mobile Crowdsensing System) (Capponi et al., 2019). They are used for crowd analysis — methods of detection, recognition, monitoring (Lamba et al., 2016), tracking (laser tracking for scanning pedestrian feet using laser range scanners (Cui et al., 2007)), estimating and counting density (e.g., using non-linear functions to calculate crowd numbers (Chaudhari 2018)).

Another example is monitoring crowd behaviour through a wide range of detection modalities, from temperature and motion to spatial proximity. This involves leveraging globally ubiquitous technologies such as smartphones and smartwatches. For instance, smartphones can be used to detect the approximate number of people (e.g., counting phones with active Bluetooth connectivity), crowd dynamics, such as pedestrian flow and bottlenecks. Social media, such as Twitter and Facebook, are also useful in crowd management by monitoring keyword use to detect crisis situations and receiving feedback from the crowd. Besides providing simple numerical information, technologies also enable crowd

behaviour prediction, e.g., for characterizing and automatically detecting anomalies in the crowd (detecting acts of violence or behavioural analysis) (Yaseen, 2013).

To ensure effective command and control, which are crucial elements of crowd management, information and communication technologies are utilized to enhance the crowd's experience and control. Popular technologies include geographic information systems (GIS), short message service (SMS), radio-frequency identification (RFID) tags, drones, database registration checks, closed-circuit television (CCTV), image processing, crowd simulation, fog and cloud computing, etc. (Yamin, 2019).

It is worth noting the capabilities provided by unmanned aerial vehicles, such as drones, facial recognition and people movement monitoring systems, including the Visual Signals Integrator (Struniawski et al., 2016), can also be used for crowd management during mass events.

New technologies also allow improving the preparation process for crowd management. An example of this is the Police Crisis Situations Simulator (located at the Police Academy in Szczytno) (Struniawski, 2017). The simulator conducts command and staff exercises at the tactical-strategic level, supported by a multimedia, intelligent ICT system, with a replicated real-world-like environment, using intelligent object technologies and artificial intelligence.

4. Conclusions

Every gathering of a large group of people entails the risk of various threats. Inappropriate organization of such an event can lead to tragedy. The possibility of social, natural, technical and ecological threats increases societal expectations regarding the provision of broadly understood security. Each country is obligated to create suitable conditions to ensure the protection of citizens not only during daily functioning but also during extraordinary events, such as mass gatherings organized for various reasons. Despite the progressive improvement in the level of security during mass events in Poland (confirmed by statistical data compiled by public institutions), the greatest threats currently lie in the specific nature and behaviour of the crowd.

However, it is important to be aware that the existing regulations in universally applicable laws do not guarantee the safety and proper organization of a given mass event entirely. The most significant role is always played by people who, with their decisions and actions, often determine the course of the event and the well-being of a frequently multi-thousand crowd.

Efficient crowd management is an organized effort carried out using the human, financial, technical and informational resources of various organizations (Batko, Trzaska, 2012). The effectiveness of these measures relies on the proper cooperation of all entities, including the police with the organizers of these events and local authorities. This cooperation involves defining a common goal and

working towards its achievement (reducing potential threats, ensuring the smooth running of the event, and, above all, ensuring the safety of its participants).

Crowd management mainly concerns mass events, yet the solutions employed in this domain also prove valuable in guaranteeing security at railway stations, in subways, airports, and shopping centres. In this process, modern technologies for monitoring, predicting, directing crowd behaviour and decision-support tools play a pivotal role in avoiding the necessity for reactive measures, such as crowd control.

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