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FUNCTIONING OF VIDEO SURVEILLANCE SYSTEMS ON EXAMPLE OF THE SILESIA REGION

Summary. The article presents results of the research including the effectiveness of the video surveillance systems and their influence on public safety level. The methods of organisation and the correlation between organisational factors and negative estimation of the video surveillance systems were analysed. Crime level on supervised area in relation to crime level in all city before and after the system implementation was presented. The Person's Ckor rate, Pareto-Lorenz' diagram and index of dynamics were used. The research were conducted in the Silesian Region, particularly in the Katowice.

Keywords: public safety, video surveillance system, crime, threat

FUNKCJONOWANIE SYSTEMÓW MONITORINGU WIZYJNEGO NA PRZYKŁADZIE WOJEWÓDZTWA ŚLĄSKIEGO

Streszczenie. W artykule przedstawiono wyniki badań, dotyczących efektywności systemów monitoringu wizyjnego i ich wpływu na poziom bezpieczeństwa publicznego. Zanalizowano metody ich organizowania oraz zbadano siłę zależności pomiędzy poszczególnymi czynnikami organizacyjnymi a negatywną oceną tych systemów. Zaprezentowano również jak kształtowała się liczba przestępstw na obszarze monitorowanym, w odniesieniu do liczby przestępstw na terenie całego miasta przed i po uruchomieniu systemu. W analizach wykorzystano współczynnik kontyngencji Ckor Pearsona, diagram Pareto-Lorenza oraz indeksy dynamiki. Badania objęły miasta województwa śląskiego, a szczegółowe analizy przeprowadzono w Katowicach.

Kluczowe słowa: bezpieczeństwo publiczne, system monitoringu wizyjnego, przestępczość, zagrożenie

1. Introduction

”Order, peace, and safety are the elements, which characterise a certain state, which enables an organised society to coexist and develop in an undisturbed way”.¹ Public safety as one of the factors, which shape the quality of life, lies at the basis of each society’s development. This safety includes both the real degree of danger and the factors, which influence perception of a given place by each person. Such factors include for example vandalism, littered and inadequately illuminated areas, and violating of social standards. The real degree of danger in turn is created by crime and social phenomena of a criminogenic potential.

According to T. Cielecki, crime is concentrated mainly in the area of municipal agglomerations.² In the cities these actions are concentrated primarily in places which are attractive taking into account the target, where opportunities favouring the occurrence of crime come into being. Such areas in the city are especially the downtown districts. Crime is a negative side effect of urbanization, which has an impact on weakening social control, increase of conformism, anonymousness, and relaxation of interpersonal relations. “The main features, which characterize a city are: size, density and diversity of its population. [...] These are those aspects of the city, which by impacting the social life have a significant effect on the form and effectiveness of social control and as a consequence on the opportunity to commit crimes”.³ Assuming that the criminal’s motivation results mainly from the attractiveness of the target and opportunity, preventing crime should focus on such shaping of the environment of life in the city as to create a barrier for criminal behaviours. One of such actions is the implementation of video surveillance systems.

The systems of video surveillance are elements of electronic technical security. They constitute a complex of devices which enable observation of areas and recording of occurred events. They decrease the risk of the occurrence of danger or events which disrupt safety in public places. They can have an effect on the decrease of the number of crimes as well as increase the subjectively perceived level of safety. The mechanisms which explain the way how the video surveillance systems work are the following:⁴

¹ Zaborowski J.: Prawne środki zapewnienia bezpieczeństwa i porządku publicznego. Departament Szkolenia i Doskonalenia Zawodowego Ministerstwa Spraw Wewnętrznych, Warszawa 1977, p. 7.

² Cielecki T.: Koordynacja systemu przeciwdziałania patologii społecznej, [w:] Czapska J., Widawki J.: Bezpieczeństwo lokalne. Wydawnictwo Instytutu Spraw Publicznych, Warszawa 2000.

³ Bałandynowicz A.: Zapobieganie przestępczości: studium prawno-porównawcze z zakresu polityki kryminalnej, Primum, Warszawa 1998, p. 27.

⁴ Tilley N.: Understanding Car Parks, Crime and CCTV: Evaluation Lessons From Safer Cities, Crime Prevention Unit, no. 42, HMSO, London 1993.

- Catching during an event (the scaring off function) – the video surveillance system may have an effect on the decrease of crime by means of an increase of probability that a potential criminal will be seen, detained, and punished.
- Possibility of registration in the system (archiving function) – the video surveillance system may have an effect on the decrease of crime by scaring off potential criminals who are aware of the fact that they are being watched and therefore may be registered in the system.
- “Inquisitiveness” – a decrease of crime may occur as a natural protection by the increase of usefulness of supervised areas.
- Effective use – video surveillance systems may facilitate the work of security guards, police and city guard officers by indicating where intervention is necessary.
- Duration of crime – the video surveillance system has the biggest influence on crimes which require time.
- Support for potential victims – persons who are aware of being in the field of video supervision feel more confident.

The implementation and exploitation of video surveillance systems requires incurring of large financial outlays for technical means and employment of staff to operate them. In addition, they raise many controversies in relation to the effectiveness of functioning since events are often overlooked. The doubts related to exceeding the limits of privacy and limitation of civil liberties of persons staying within the reach of cameras are also problematic. Despite these controversies, an intensive increase of the numbers of video surveillance systems is observed in Poland. Moreover, despite a lack of analysis of their effectiveness and precise information on the obtained results, positive opinions on their effectiveness are predominant among people who use these systems.

The aim of this elaboration is presenting chosen results of research related to the effectiveness of video surveillance systems, conducted in the scope of preparation of a Doctor's thesis entitled “Methods of Organizing a Surveillance System in Managing Public Safety in a City”. This research was conducted based on the EN 50132 standard: *Alarm systems. CCTV surveillance systems used in security*.

2. Organization of video surveillance systems

Research related to organisation and functioning of video surveillance systems was carried out in the Province of Silesia between 2004 and 2006. In this period 16 Silesian cities had a video surveillance system (fig. 1). The first one of those was launched in 1997 and 50% were handed in for use in 2001. They included from 3 to 53 cameras both revolving with an

optical zoom and stationary ones. 11 out of 16 video surveillance systems were covered by the research. Gliwice, Radlin, Ustroń, Koszęcin, and Imielin were not covered.



Fig. 1. Cities of the Silesian Region, where the video surveillance systems are used
Rys. 1. Miasta województwa śląskiego wykorzystujące systemy monitoringu wizyjnego
Source: own elaboration.

The results of the conducted research show that the most common goal of implementing video surveillance systems are:

- decreasing of the number of crimes and other illegal acts – 42%,
- observation of events and areas – 30%,
- observation of pedestrian and vehicle traffic – 20%,
- improvement of the feeling of public safety (preventive function) – 8%.

When organising city surveillance systems it is necessary to follow the instructions specified in the PN-EN 50132-7 standard: *Alarm systems, CCTV surveillance systems used in security. Instructions for use*. Among the discussed systems only in four cases the recommendations of this standard were followed. However, in all the analysed systems the instructions specified in the standard were fulfilled in 79%. A list of the principal groups of recommendations specified in the standard and their inclusion in the realization of the video surveillance systems being researched in the Province of Silesia is presented in figure 2.

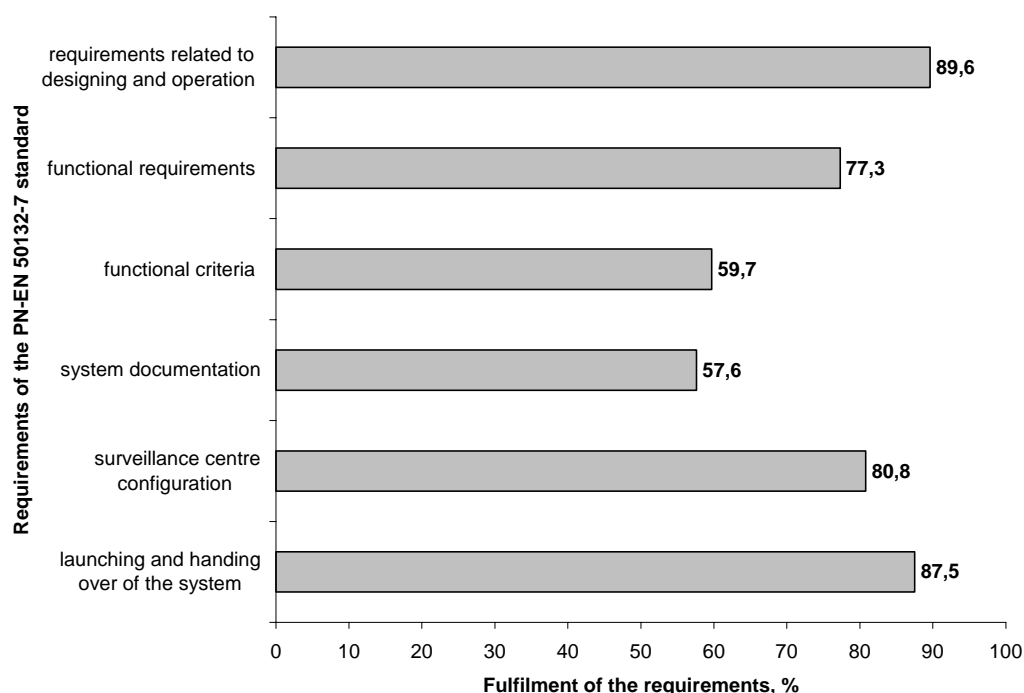


Fig. 2. Fulfillment of the PN-EN 50132-7 standards requirements in the video surveillance systems in the Silesian Region

Rys. 2. Realizacja wytycznych zawartych w normie PN-EN 50132-7 w systemach monitoringu wizyjnego, w województwie śląskim

Source: own elaboration.

In the examined surveillance systems only in five cases the surveillance centre was used exclusively for image observation. In the remaining systems the images were observed most commonly on an ad hoc basis in the Police and City Guard guardrooms. In case of seven systems the personnel conducting surveillance underwent periodical training. In four self-governments that had a surveillance centre at their disposal special intervention forces were appointed to react to events registered in the surveillance system. These are mainly two additional patrols composed of Police and City Guard officers. In the other seven cases, interventions are carried out by patrols on duty, the main function of which is to carry out statutory tasks.

During the research it was observed that the video surveillance systems operate for the whole day, however taking into consideration insufficient number of personnel the images were only observed in specific situations. Observation was carried out by the Police and City Guard officers. It was the only duty of the observer or one of his/her duties.

Results show that the effects of video surveillance system functioning cover the following:

- increase in crime detectability by 10% on average,

- decrease in crime by 43% on average,
- shortening up to 50% of the time of reaction in case of noticing an event in the video surveillance system.

According to 91% of users, the video surveillance systems did not fully meet the set goals. In order for further analysis the force of dependence between each organisational factors and the negative evaluation of these systems was evaluated. In order to accomplish this, Pearson's C_{kor} contingency coefficient was used. Based on the determined correlation forces the Pareto-Lorenz' diagram was prepared. The organizational factors were lined up according to the force of their impact, the percent share of each factor and cumulated directed number. The diagram obtained on this basis is presented in figure 3.

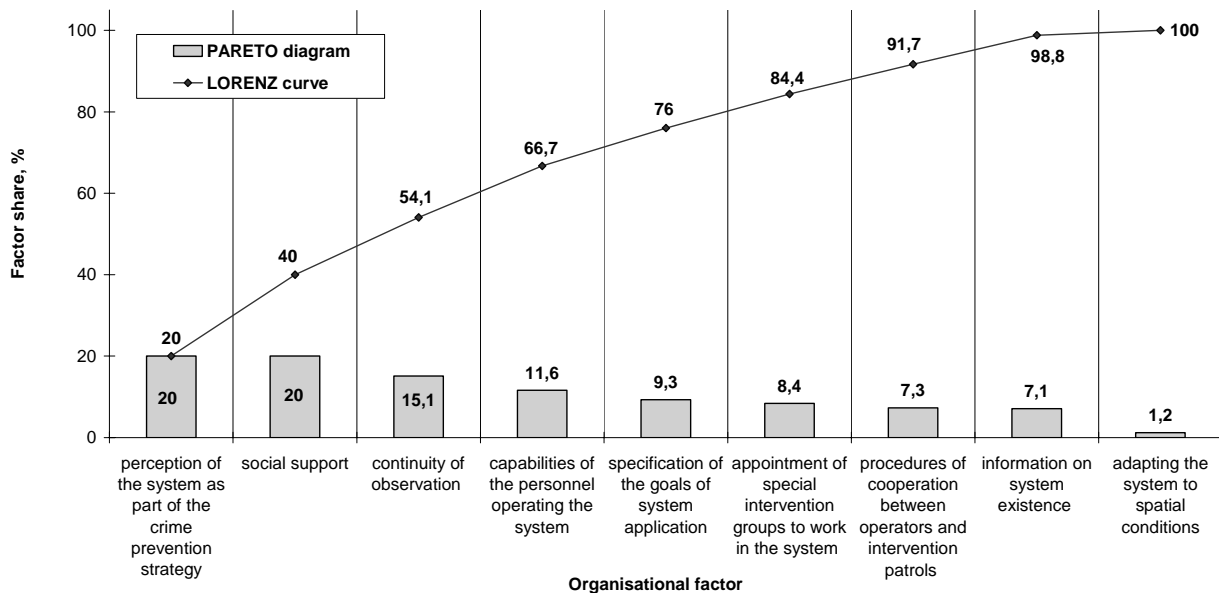


Fig. 3. The Pareto-Lorenz' diagram of the correlation between organisational factors and negative estimation of the video surveillance systems

Rys. 3. Wykres Pareto-Lorenza zależności między czynnikami organizacyjnymi a negatywną oceną systemów monitoringu wizyjnego

Source: own elaboration.

As a result of Pareto-Lorenz' diagram result analysis a group of factors was obtained that had the biggest influence on the negative evaluation of video surveillance systems. The first three factors from the left – perception of the system as part of the crime prevention strategy social support, continuity of observation – decided about the causes of negative evaluation in 55%.

3. The influence of video surveillance systems on the level of public safety in Katowice – case study

In Katowice the video surveillance system was implemented in places with the greatest danger of crime in two stages – in 2001 and 2005. The analysis of the share of crimes in the supervised area in relation to crimes in the territory of the whole city shows their constant decrease. This tendency is presented in figure 4.

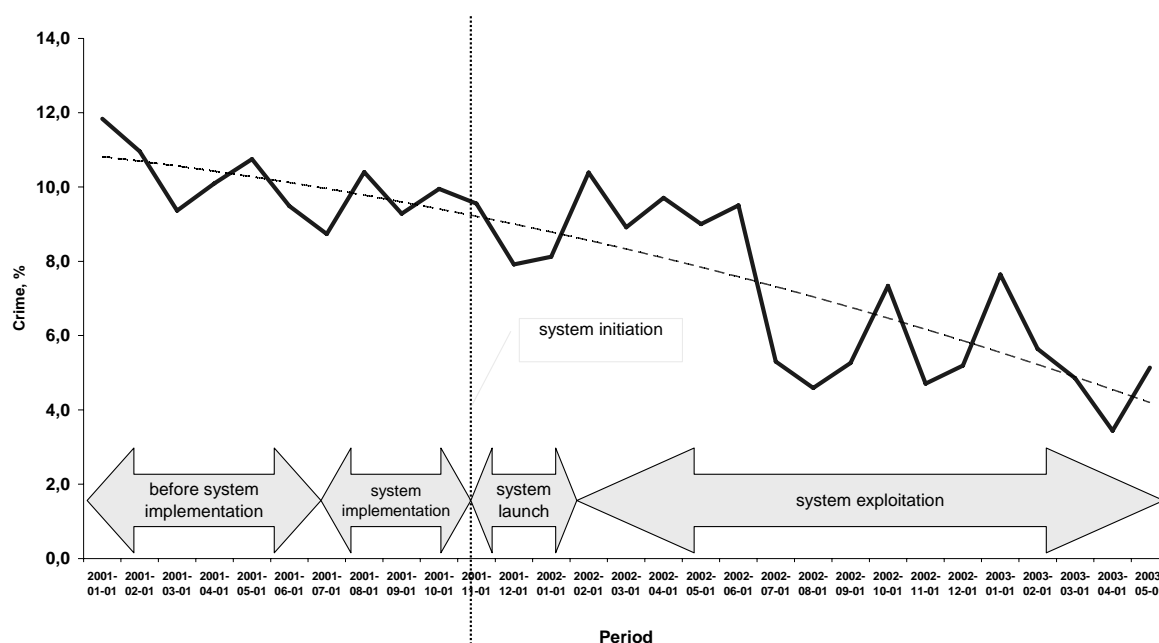


Fig. 4. Crime level on supervised area in relation to crime level in all city before and after the system implementation

Rys. 4. Udział liczby przestępstw na obszarze monitorowanym w odniesieniu do liczby przestępstw na terenie całego miasta przed i po uruchomieniu systemu

Source: own elaboration.

The analysis of the examined video surveillance system functionality enables to state that the decrease of the number of crimes in the supervised area was almost 50% after one year of its functioning. The greatest decline was shown in the number of sex related crimes, terrorism, and crimes related to drug addiction, burglary, and car thefts. In January 2001 in the region which still had not been included in the surveillance system, this number constituted almost 12% of crimes in the whole city. In May 2003 the number of events disrupting public safety and order in this part of the city was already less by a half compared to the moment when the system was implemented. The analysis of the dynamics of changes in the crime level in Katowice was illustrated in figure 5.

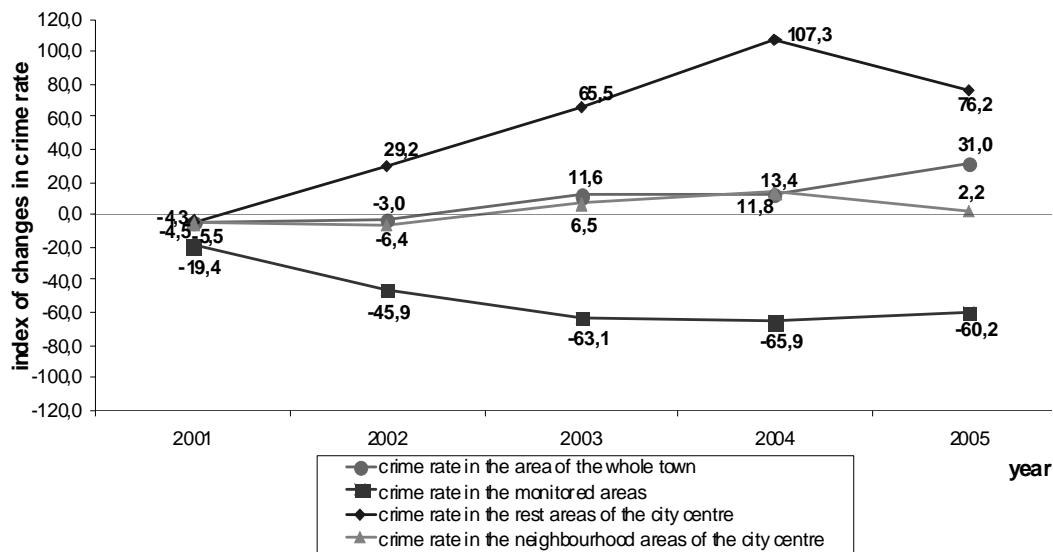


Fig. 5. Index of the analysis of changes dynamics of crime in the Katowice (2001-2005)
 Rys. 5. Indeks dynamiki zmian liczby przestępstw w określonych rejonach Katowic i w całym mieście w latach 2001-2005

Source: own elaboration.

The index of the dynamics of changes in the number of crimes in the whole city shows its constant increase in the years 2001-2005, by 9.4% annually on average. The index of the dynamics of changes in crime in the districts bordering the supervised area is similar. In the supervised area, in the first three years of the system's functioning, there was a decline of criminal phenomena by over 60% compared to the year before the examined system was implemented. Three years after the launch of the system the number of crimes stabilised and it is at the level achieved in 2003. The analysis of the results related to the increase of crime in the unsupervised areas of a partly video supervised district at its concurrent decrease in areas covered by the system proves that criminal phenomena were transferred to uncontrolled zones. This transfer is a result of a comparable target attractiveness of these areas, smaller risk of being captured, and no possibility of recording in the surveillance system.

4. Conclusions

Video surveillance systems do not always enable preventing dangers, however – when property used and when archiving is possible – they generally enable a reconstruction of events and determination of the perpetrators. Every day effective systems supply a great deal of evidence of all types of crimes and transgressions. A positive example of their application

is the identification of the perpetrators of murder at the station in Brussels on 12th April 2006 or the persons taking part in the bomb attack in London on 7th July 2005.

In the video surveillance systems the significance of organisational factors is equally important as their technical parameters, as without a competent organisation, even the most modern system will not be effective. These systems are not a panacea for the increase in crime, but they are an element of integrated public safety management systems.

The results of the conducted research enabled the formulation of the following conclusions:

1. Effective operations of video surveillance systems requires cooperation of specialized territorial self-government units. This forces to develop clear operation procedures and define the limits of authority.
2. The principal action in video surveillance system management is ensuring an adequate number of persons for their operation and separation of the function of detecting crimes from the intervention function. Only a clear division of competences and responsibility may ensure effective functioning of video surveillance systems.
3. The negative effect of the functioning of video surveillance systems is the possibility of transfer ring a part of the crimes to directly bordering areas, which are comparably attractive to potential criminals.
4. The beneficial effects achieved in the initial phase of the systems' existence may deteriorate after a few years from their launching, which may be the effect of organisational mistakes, a decline of the initial enthusiasm of the users, routine in the work of the operators, as well as the criminals' "getting used to" the existence of surveillance systems.
5. In the areas covered by video surveillance, a slight decrease or even increase in the number of events in Police statistics of crimes may be a result of increased detectability. The preventive effect of surveillance systems may have an influence on the increase in detectability, and thus on the number of recorded crimes, although the general crime decreases and the increase in public safety takes place.
6. The positive effects of video surveillance systems' functioning are not only a result of the operation of the system alone, which is a complement of undertaken endeavours and prevention strategy. However, its positive effect on the level of crime and the fulfilment of the preventive function cannot be denied.

Bibliography

1. Bałandynowicz A.: Zapobieganie przestępczości: studium prawno-porównawcze z zakresu polityki kryminalnej, Primum, Warszawa 1998.
2. Cielecki T.: Koordynacja systemu przeciwdziałania patologii społecznej, [w:] Czapska J., Widawki J.: Bezpieczeństwo lokalne. Wydawnictwo Instytutu Spraw Publicznych, Warszawa 2000.
3. Tilley N.: Understanding Car Parks, Crime and CCTV: Evaluation Lessons From Safer Cities, Crime Prevention Unit, no. 42, HMSO, London 1993.
4. Zaborowski J.: Prawne środki zapewnienia bezpieczeństwa i porządku publicznego. Departament Szkolenia i Doskonalenia Zawodowego Ministerstwa Spraw Wewnętrznych, Warszawa 1977.

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