

THE EFFECTIVENESS OF ACTIONS IN THE FIELD OF ROAD SAFETY

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ABSTRACT

The article is on the measurement of effectiveness of efforts to improve road safety. It was indicated that the need to measure the effectiveness of road safety actions stems from strategic documents in the field of transport. Effectiveness was defined as an economic category used for evaluating the activities, and there was also shown the definition diversity of the concept of effectiveness. In economics effectiveness is presented in terms of economic and organizational chart. The article refers to the study on the effectiveness of the allocation of resources carried out by the Italian economist Vilfredo Pareto, who formulated the theory of management balance, acting as the main interpretation of the concept of effectiveness in the economy. In the article it was also indicated on the specificity of measuring effectiveness in efforts to improve road safety and an essential element of which is the human factor. The investment efficiency calculus in the area of road safety was presented as a social one.

Introduction

Road safety is considered a social issue in the economic dimension. The need to measure effectiveness is a natural element of rational management and allocation of resources, in terms of activities undertaken with a view to improving road safety. The need to measure the effectiveness of road safety actions in Poland stems from the

strategic documents, such as "State Transport Policy 2006–2025", or "Transport Development Strategy to 2020 (with a view to 2030)".

Effectiveness is defined as one of the basic categories of activities evaluation. In economics effectiveness can be considered in two perspectives: economic and organizational. The first one is related to research on effectiveness carried out in the context of economic theory. The second is developed on the basis of management science and is a category identifying the synergetic effect of an organization, which benefits from specific interoperability agreements within the framework of the organizational systems (Piekarz, Stabryła, 1989, p. 175). The diversity of interpretative concept of effectiveness makes the presented theories do not cover all the issues, being the basis of the modern overall concept of efficiency as an orientation resulting in increasing of the outcome and the cutting of costs.

In considering the effectiveness of the action taken it is necessary to extract the notion of "efficiency" and "effectiveness". According to Peter Drucker, the precursor of management sciences, "efficiency" means doing things in the right way and is a concept related to the inputs and results. "Effectiveness" describes doing the appropriate things, what refers to the skill of choice of relevant objectives (Stoner, Freeman, Gilbert, 2001, p. 24). The variety in meaning means that the notion of "efficiency" is more general than "effectiveness" (Michałowska, 2012, p. 14).

The issue of road safety, as an interdisciplinary subject relating to many aspects of social life, gives wide opportunities to evaluate its effectiveness. Determination the effectiveness of the efforts to improve road safety is necessary for at least two reasons. The first is the need to carry out such analysis indicated in the documents specifying the transport policy in order to create a basis for carrying out effective and long-term actions for road safety. The second is the need for the rational allocation of the available resources. Measures taken to improve road safety can be considered in category of economic efficiency, meaning the ratio of the value of expenditure incurred for the values obtained.

The need for carrying out economic analyses of the effectiveness of efforts to improve road safety is related with limited resources which have been available to decision makers, as well as with the need to make choices related to the allocation of these resources. Economics in conjunction with human factor and road safety is a bit of a different dimension. In this case, it should not be based solely on an analysis of the value of expenditure incurred for the values obtained, as it cannot be concluded that one life is less valuable than a hundred others, and that saving one life is economically unjustified, but a hundred others is. In this connection, the inputs and actions taken to ensure road traffic safety may not be dealt with only in the categories of expenditure, but, above all, in the category of investment designed to ensure the attainment of social and economic objectives. Undeniably they are expense in an accounting sense, but life is at stake, that is priceless, the highest good. Taking into account the fact that in the case of road safety the obtained results are measured by the number of casualties of traffic accidents, and the life of the unit is priceless and parent to all the others, it is more relevant, it seems to consider these actions in the category of organizational efficiency, meaning the optimal way to combine resources to achieve the goal. Determination of efficiency requires in this case, the use of qualitative methods as well, such as a survey, internal surveys and expert method. The aim in this case will be the permanent improving of road safety, resulting in fewer deaths on the roads. Reference efficiency issues in the road safety activities to management sciences has its reasons. According to M. Michałowska the effectiveness is an action and behavior, which is to lead, using resources in an optimal way, to achieve the goal. The attainment of the objectives causes the effects returning to the system by raising the value of the resources. In this context, the efficiency is called a positive feedback, and the entire process

is referred to as effectiveness management. M. Michałowska presented the management functions as a function of effectiveness management. This allowed for the submission of the effectiveness management process, consisting of (Michałowska, 2012, p. 21):

- planning the effectiveness,
- organizing the effectiveness,
- motivating the effectiveness,
- monitoring the effectiveness.

To achieve a high effectiveness of operation of the system it requires to identify the key areas of efficiency and determine effective control systems (Stoner, Freeman, Gilbert, 2001, p. 469). According to J. Stoner the key areas of effectiveness (or results) are those elements of the unit, or of the organization, which must function effectively to the whole unit or organization success. These areas are typically associated with the basic activities of the organization or with related groups of them occurring throughout the entity or organization. In case of such a complex system, which is a road safety system, there can be identified a few key areas of effectiveness. These include subsystems of barriers and security, functional and safety management, because they underpin the effective operation of the whole system. To ensure high effectiveness also requires evaluation of the action, and so the determination of strategic control points, in which should be carried out observation or collection of information. The best way to choose strategic control points is to focus on the most important elements. This is connected with the fact that it is generally a small proportion of the activities, events, people or objects in the operation causes a significant part of the cost, or other adverse events. As strategic points of the control system, the tools of road safety management system may be indicated. The assessment of the level of their use allows to specify the efficiency or effectiveness of these tools, as well as the entire road safety management system. The perception of activities aimed at improving road safety in terms of investments gives the ability to determine its efficiency by using the investment efficiency calculus. In the literature there are several types of investment efficiency calculuses depending on the adopted classification criteria, for example its preparation, to which it is used, how it will be carried out, the nature of the investment (Rogowski, 2013, p. 95) (Table 1).

Table 1. Types of investment efficiency calculus

The criterion	The classification
The moment of drawing up	– prospective (ex ante)
	– retrospective (ex post)
The objective	– absolute
	– relative (comparative)
A method of conducting	– multi-criterial
	– single-criterial (synthetic)
The nature	– commercial
	– social

Source: Rogowski (2013), p. 95.

A special case of the application of the relative efficiency calculus is the situation, when the results obtained as a result of the investment may not be expressed in value but only in property terms, which makes it impossible to assess the absolute effectiveness. In this case the calculus will be the comparison with the different variants

(Borowiecki, 1995, p. 16). This might be particularly applied in the analysis of the effectiveness of the measures aimed at improving road safety. Taking into account the method of conducting the efficiency calculus there is multi-criterial calculus, based on a set of sub-indices for different aspects of investments, and single-criterial (synthetic) based on a single synthetic indicator taking into account basic measurable elements that specify the level of effectiveness. Taking under consideration the nature of the calculus there is commercial and social one. The commercial is used in budgeting of commercial investments, while the social one applies to the social and hybrid investments (Rogowski, 2013, p. 95). S. Kasiewicz and W. Rogowski (2009, p. 28) determine the commercial investments, characterized by lack of direct and indirect social consequences, regardless of the actors performing the function of the initiator of the investment and financing. As social investment determine that ones, that have a strong direct and indirect effects on society, both in terms of benefits and costs, regardless of the legal status of investors and funding sources of the investment. In this connection to the areas in which investment projects undertaken are heavily saturated with social aspects include, among others: employment, environment, health, waste management, transport, educational projects, social welfare and any infrastructure (Kasiewicz, Rogowski, 2005, p. 220). S. Kasiewicz and W. Rogowski indicate four specific features of social investment projects, compared to public or commercial:

1. In the formulation phase of the objectives of the project and identification of its effects occur the social benefit factor: less morbidity, higher social care quality, cleaner air, less pollution, better health services quality, decrease the effects of road accidents.
2. It is necessary to bear the costs of achieving social objectives, for example. construction of safe roads.
3. The effects of social benefits are generally a little prone to economic indicators and quantitative measurement, for example: improvement of living conditions, improvement of security, increase confidence to public institutions. Benefits and costs are often qualitative in nature.
4. The costs do not fully reflect the level of negative or positive consequences of actions, for example the costs of increasing the intensity of the congestion, difficulties in communication, increasing in noise, and the dangers of road traffic. It is easier to identify the direct costs, and it is more difficult to determine the indirect costs arising from the relationship, as it is in the case with road safety.

An increasingly important category of investment are hybrid investments. This is referred to mixed projects, in which there are both costs and benefits to society, as well as the commercial costs and benefits (Kasiewicz, Rogowski, 2009, p. 29). The social aspects of commercial investment play an increasing role. The implementation of hybrid (and social) investments has an impact in particular on health, safety and the life quality of the inhabitants of the given area.

The investments efficiency calculus in the field of road safety as a social calculus of efficiency

The specificity of investments made in road safety sector makes that decisive function plays the social aspect and not the commercial (financial). This is the domain of the social calculus of efficiency, which is in particular visible – compared with a commercial approach – at the price accents. Here dominates a strong social accent, both on the individual elements of the calculus, as well as in its aspects, e.g. in formulating the decision-making criteria (Kasiewicz, Rogowski, 2009, p. 143). W. Rogowski notes that in that case, differently to commercial calculus, are defined the three basic components: benefits and costs, the discount rate and the decision-making criteria. The most commonly used method for assessing effectiveness in case of investments, such as road safety, is the

cost-benefit analysis. The author indicates the three main reasons for this. As the first indicates that this method is considered to be an effective tool in supporting the decision making process in allocation in the public sector, mainly because of the possibility to take into account a wide range of socio-economic effects of investments. The second one – the cost-benefit analysis is considered to be a tool for measuring the effectiveness of the allocation of resources. The third one – it introduces a uniform and clear criterion for the evaluation of investments by bringing all the results to a money dimension (if possible) (Drobniak, 2002, p. 74). In case of investments in the area of road safety, the referred first two premises, as in the case of any other social investments, it seems to be obvious. However, the specificity of the road safety issues causes that, in the third one, bringing life to the money saved dimension is possible only after the adoption of some statistical estimates, because the markets for certain “goods”, such as for example “human life” does not exist or operate inefficiently. In this case, the monetary value of such goods is estimated as if there was a good market and was working efficiently. In the analysis of the efficiency of social investment, such as road safety, all the consequences of their implementation should be taken into account, both positive and negative. Complete analysis of such investment should also include financial analysis, which will indicate the cost-effective or scarce projects, but which are socially valuable. Following W. Rogowski, the evaluation of investment efficiency, such as road safety, cannot be guided by purely financial aspects, but the main importance should be given to the social aspects. The effectiveness of actions to improve road safety is most commonly measured by the number of saved lives, and the value of human life is a part of a cost-benefit analysis, that is often featured as benefit of the investment. Research in this area was carried out mainly in the United States, and the basic criteria for the valuation of human life were, for example, bonus for making risky trades, tendency to pay for more safety (e.g. safer cars), the behavior towards pedestrian crossings, safety belts, speed of travel by car and a tendency to improve one's safety. Similarly there was carried out a study of the cost of injuries and personal injury. Limitations of these estimates, however, is that they do not take into account the pain, suffering and other dimensions of unhappiness and indirect costs, such as e.g. court proceedings (Kasiewicz, Rogowski, 2009, p. 164). Having regard to the specific investment characteristics presented in the area of road safety and based on the theory of W. Rogowski it can be concluded that the methodology of investment efficiency calculus in the area of road safety should take into account the following conclusions (Kasiewicz, Rogowski, 2009, p. 172):

1. Bearing in mind that in the case of investments in the area of road safety can occur diversity in the valuation and cost-benefit preferences at the time (another preference to incurring the costs and another to obtain benefits), which can translate into a different value for the benefit of the discount rate for the benefits and costs. This means that it does not have to be followed with the same value and costs impairment at the same time, and does not have to be followed by the same value and costs increase at the same time. Investments in individual road safety system tools will not always result with the same effect in the same time horizon. This is connected with the vulnerability of different groups of beneficiaries (society) to undertake activities, as a result of preference to incur costs and gain benefits.
2. Investments in road safety are characterized by different social discount rate. Local communities may have different social preferences to bear and to obtain the benefits of different types of investments. The investment generating benefit for the local community or its parts must not be of the same value for another local community or its other parts. The benefits of investments in the field of road safety can be perceived differently by different communities. It is associated with different level of acceptable risk of the occurrence of dangerous situations and different level of ability and willingness to bear the cost of such

investments. It should be added that in this case the notion of costs also includes the need to adapt to the prevailing standards, for example to drive at a slower speed forced by the elements of road infrastructure.

3. In the case of investments in road safety, just like in other social investments, it is difficult to transfer individual preferences into the general preferences of social groups. This involves the fact that group preferences are not a simple sum of individual preferences, on the contrary, they may be mutually exclusive, e.g. a high level of road safety, with a low interoperability willingness, that is compliance with generally accepted standards. Bearing in mind the objective of activities in the field of improvement of road safety, which is reducing the number of fatalities and severely injured persons in road traffic, the individual preferences of individuals or small communities may not be excluded from the efficiency investments calculus in the area of road safety.
4. The system of road safety will be coherent and effective in macro scale, if such a balance will be ensured in the micro scale. Achieving the balance and efficiency in micro scale is a fundamental factor in optimal allocation of road safety system resources in macro scale.
5. In case of investments in the area of road safety there may be divergent preferences among the different groups of beneficiaries. W. Rogowski indicates that in this case, the two different approaches can be used: the first based on the correction of benefits and costs, and the second based on the correction of the social discount rate. Correcting can be obtained by applying a system of weights, acting to estimate the benefits, costs or discount rate for different categories of beneficiaries. Therefore, determination of the effectiveness of road safety system tools requires the use of each of the tools by giving adequate weight.
6. Projects related to road safety improvement may have, and increasingly have, a commercial and social aspect at the same time. These are called the hybrid projects.

Conclusions

The evaluation methodology of effectiveness of actions to improve road safety requires taking into account the above conclusions. It is required by the nature of the researched subject and its interdisciplinarity, with a special emphasis on the social and economic dimension. A multitude of tools of the road safety management system causes that precise determination of the impact of each of the road safety improving tool is not possible. The effectiveness of each of the tool depends on many local circumstances, shaping the demand for safety. It could be: the vulnerability of different groups of beneficiaries, the level of acceptable risk by the local community, the statistical value of human life in the community, which determines the willingness to take risks the loss of health or life, the readiness to bear the cost of investments in road safety. Not to be missed also the synergies as a result of the use of groups of different tools, and having a significant role in achieving the objective of road safety improvement.

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