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THE QUALITY MANAGEMENT SYSTEM'S PROCESS MODEL OF THE VEHICLE INSPECTION STATIONS

Abstract: The article presents the methodological principles of the quality management system's "process model" construction of the Vehicle Inspection Station, a general formula of this model and a concept of the quality assurance evaluation of the quality management system processes based on the example of vehicle inspection process.
Keywords: quality management system, process model, Vehicle Inspection Station

1. INTRODUCTION

Designing the quality management system (SZJ) relies on the systemic approach. The essence of this approach is intentional noticing the processes, which have their application in the quality management as well as sequence and interconnections between these processes defining the system creating framework of SZJ. This approach has, in the specialist literature, been called „process approach", and the model built based on this approach has been named as "SZJ process model" [5]. An attempt to use such an approach has been made in modelling SZJ of the Vehicle Inspection Station (SKP).

An inspiration to presenting a process model of SZJ SKP was commencing the studies for the project run at the Motor Transport Institute entitled: „Studies and developing the quality management system model, increasing effectiveness of the motor vehicles technical inspections". Inspection results of the SKP activities [7] showed essential negligence in the quality of the SKP functioning. This resulted in admitting to the operation on the public roads of the 185939 vehicles not complying with the Road Traffic Law [13]. Such a status quo has to raise serious worries as to the ensuring vehicle traffic safety on the public roads.It requires taking actions with respect to the quality management at SKP, as the vehicles technical inspections conducted by SKP serve an important role within a vehicle traffic safety ensuring system. To fulfil this most important role, the SKP must rigorously

and consistently present quality of the vehicle inspections conducted, which will not be a source of any doubts.

2. METHODOLOGICAL FOUNDATIONS OF THE SZJ SKP DESIGN ENGINEERING

Engineering of the SZJ SKP implementation, if it is to be conducted correctly, should rely on the established methodological rules, based mainly on a correctly constructed process model of the system. This model ought to identify:

- SZJ environment, which generates certain inputs and outputs of the system,
- SZJ processes, which are necessary for the quality management of the vehicle inspections,
- relationships and sequences between the processes,
- quality requirements for the processes defined.

SZJ SKP model is consciously and purposefully created in order to replicate a selected fragment of reality in a strictly determined way [1].

Aim, which is an inspiration of creating a model, as well as the process of its creation itself, makes the model to be a simplified replication of a selected fragment of reality. Generally it is accepted that between the given fragment of the reality and its model there should be certain relationships taking place, in such a way as to make it possible for the model to be used by all its users.

The list of the requirements facing the model covers: purposefulness, structure, correctness and the model boundaries. Fundamental role is played here by the concept of the aim, for it is linked with the future required state or the way for the certain fragment of the reality to behave. That is why looking at the aim from its realisation side it is important to allocate concrete attributes it should meet. Some of them could be such as:

- achievability,
- feasibility,
- identifieability,
- stability [3].

The attributes mentioned must be taken into account while formulating goal in such a way as to create model, in which an aim considered will be described by a finite number of characteristics. The characteristics of the projected aim will portray the properties of SZJ as a whole, properties of the component element identified in it, relationships between these elements and properties or relationships between the aim and its environment.

SZJ SKP models may be presented in various forms. The language that is used for describing the system enables to interpret the model in the form of the written description, schematic one or mathematic.

In this paper it has been accepted that sufficiently understandable and suggestive form is a percentage description of the SZJ SKP process model [5], resulting from observing processes used in the quality management as well as sequences and their mutual interactions.

Taking into account, the method of constructing the SZJ SKP model has been determined.

3. SZJ SKP PROCESS MODEL GENERAL FORMULA

Based on the system analysis carried out, the essential SZJ SKP environmental elements recognised were: [10, 11, 12, 13, 14]:

- state administration authorities, which create legal acts defining requirements referring to the SZJ SKP management processes as well as vehicles inspection processes,
- Technical Transport Supervisory Board, which issues certificates representing a proof of compliance with the infrastructural requirements and conducts exams for the diagnostic personnel candidates ,
- The Central Office of Measures and District and Regional Offices of Measures, which legislates measuring instruments used in the vehicles inspections,
- Calibrating accredited laboratories, which conduct calibration of the measuring instruments,
- Technical Supervisory Board, which tests and controls SKP technical equipment subject to the technical supervision,
- Police and Road Transport Inspection, which provide information about the technical condition of the vehicles used on the public roads,
- National Criminal Register, which provides information about criminal offences of the diagnostic personnel.

SZJ SKP has to contain all the processes, which are necessary in fulfilling the function of the quality management (fig. 1).

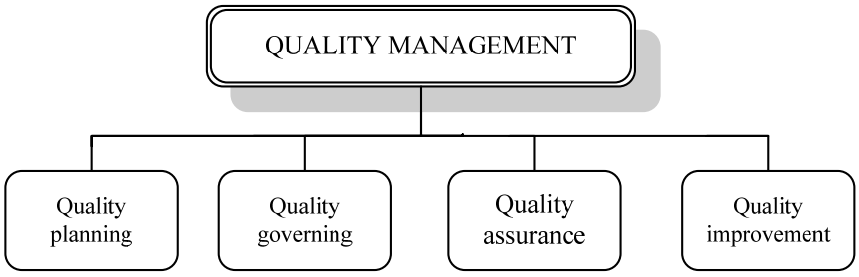

Fig. 1. Quality management functions. Source [5]

Quality planning is directed at setting measurable goals concerning quality and quality policy, which should be realised within the SZJ SKP management processes [8].

Quality Control is directed at complying with the legal requirements, which should be adhered to within the vehicles technical inspections processes.

Quality assurance is directed at ensuring trust, in the fact that the legal requirements will be complied with. It should be realised in the SZJ SKP management processes.

Quality improvement, is directed at increasing the ability to meet the quality requirements. It should be realised within the corrective and preventive actions processes.

Based on the assumptions accepted, the general formula of the SZJ SKP process model has been developed (fig. 2).

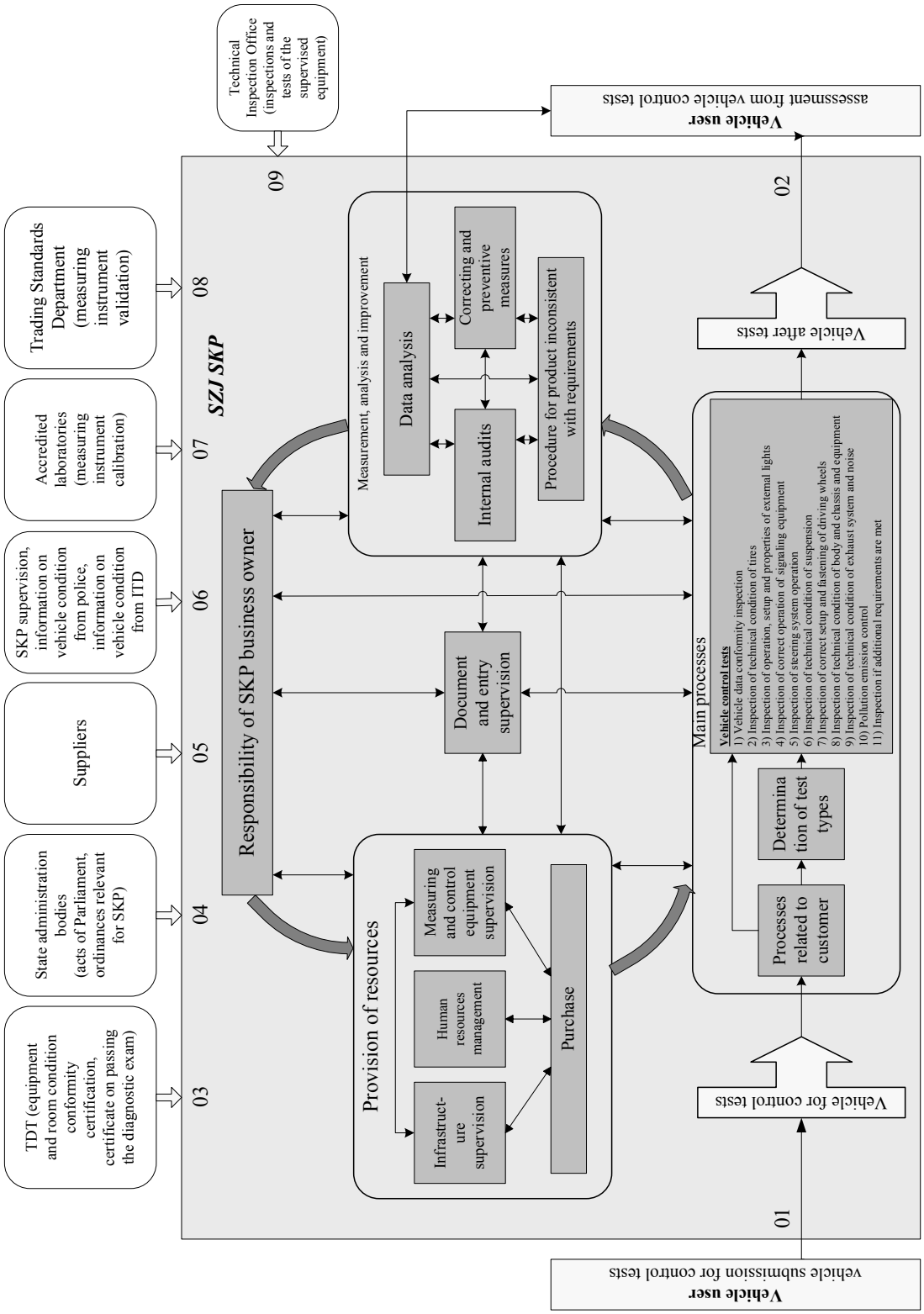

Fig. 2. General formula of the SZJ SKP model. Source: own papers

4. SZJ SKP PROCESSES QUALITY ASSURANCE

Practical significance of the SZJ SKP model lies in its use in the process of implementing SZJ as well as evaluating effectiveness of maintaining and improving SZJ.

Evaluating effectiveness of maintaining and improving SZJ must be based on the quality assurance assessment of all the quality management processes. Thus it is necessary to determine the quality requirements for those processes. The quality assurance requirements of each process concern each element of the input, output, monitoring the process realisation, process owner and quality goals. Thus they refer to all quality characteristics of the processes. Concepts of determining quality requirements for the individual characteristics are presented using as an example the basic process realised at SKP, namely the vehicle inspections process (fig. 3).

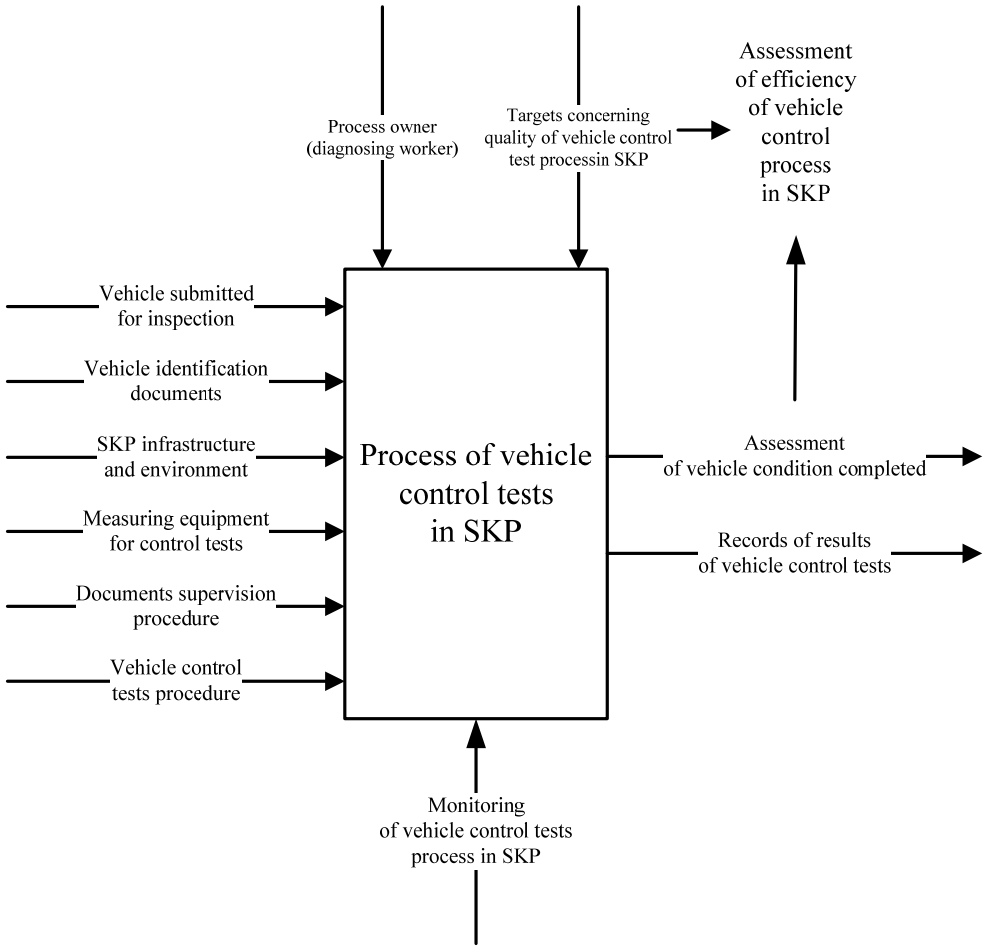

Fig. 3. Quality characteristics the vehicle inspections process at the SKP. Source: own papers

Description of the quality requirements in the assessment of the vehicle inspection quality assurance process should cover [6]:

Table 1.

Quality requirements of the input elements

$W_{1,1}$ -	It is necessary to identify the documents stating the admitting the vehicle to the traffic operation, identification features of the vehicle, documents issued by the manufacturer or starost declaring serviceability of the devices subject to control by the Technical Supervisory Board, if such devices are fitted to the vehicle.
$W_{1,2}$ -	Infrastructure and environmental conditions of the SKP should comply with the detailed requirements concerning range of the vehicle inspections being conducted. The devices subject to control by the Technical Supervisory Board must have documents confirming their serviceability.
$W_{1,3}$ -	Measuring equipment to be used for the inspections has to have a metrological confirmation issued by the accredited calibrating laboratories and/or the laboratories of the Office of Measures.
$W_{1,4}$ -	It is necessary to set out a documented procedure of the supervision over the documents and notes used and made during the process of the vehicle inspections.
$W_{1,5}$ -	It is necessary to set out a documented procedure of the vehicle inspections, determining the order of proceedings in the inspections, and being in the agreement with the legal regulations.
$W_{1,6}$ -	There should be a goals set out concerning the quality of the basic processes.

Table 2.

Quality requirements concerning the elements of conducting inspections

$W_{1,7}$ -	There should be arrangements made and implemented at SKP concerning communication with the clients, with respect to: information on the inspections conducted and return information from the client, including that about the complaints.
$W_{1,8}$ -	Process owner (diagnostic staff) must have appropriate authorisations, confirming competencies to conduct inspections issued by the starost.
$W_{1,9}$ -	Inspections procedure should be accessible on the vehicle tests stand.
$W_{1,10}$ -	It is necessary to plan and supervise conducting the vehicle inspections at the SKP.
$W_{1,11}$ -	It is necessary to take care of the vehicle entrusted by the client for the tests to SKP.
$W_{1,12}$ -	It is necessary to secure the client's vehicle while conducting the inspections at SKP.
$W_{1,13}$ -	The notes must be made of the inspections conducted, which are to be retained.
$W_{1,14}$ -	It is necessary to monitor devices and equipment used for the vehicle inspections.
$W_{1,15}$ -	While conducting the vehicle inspections it is necessary to make appropriate corrective and preventive actions.
$W_{1,16}$ -	The confirmation of the effectiveness of the inspection should be positive results of the process audits carried out.

Table 3.

Quality requirements of the output elements

$W_{1,17}$ -	It is necessary to define measuring criteria of the effectiveness assessment referring to the formulated goals concerning quality and retain notes from the process effectiveness assessment conducted.
$W_{1,18}$ -	It is necessary to make and retain notes of the results of the vehicle inspections.

Evaluation of the degree of the inspection quality assurance process depends on the range of the quality requirements met. Table 4. present the concept of such evaluation.

Table 4.

Expert evaluation of the vehicle inspection quality assurance process at SKP

Range of the proposed evaluation degree of the vehicles inspection quality assurance process	Verbal assessment of the degree of the process quality assurance	Criteria of the numerical assessment of the degree of the process quality assurance
Positive assessment of complying with no more than 13% of the quality requirements of the basic processes	Process quality is not ensured	0
Positive assessment of complying with more than 13%, but no more than 37% of the quality requirements of the basic processes	Negligible degree of the process quality assurance	0,25
Positive assessment of complying with more than 37%, but no more than 62% of the quality requirements of the basic processes	Moderate degree of the process quality assurance	0,5
Positive assessment of complying with more than 62%, but no more than 87% of the quality requirements of the basic processes	Good degree of the process quality assurance	0,75
Positive assessment of complying with more than 87% of the quality requirements of the basic processes	Complete degree of the process quality assurance	1,00

Presented in the Table 4. parameterised criteria of the numerical assessment of the degree of the vehicle inspections process quality assurance are linked with the input data base being created, which the authors intend to use in building neural model of the SZJ SKP effectiveness evaluation [7].

5. SUMMARY

In the attempt to model SZJ SKP made by the authors most useful turned out to be process approach. They succeeded in designing general formula of the SZJ SKP model using this line of system thinking (fig. 3), presenting all quality management processes having application at SKP as well as sequences occurring between these processes, forming framework for system creating of SZJ SKP.

Practical aspect of the SZJ SKP model is its use to implement, maintain and improve the quality management system.

Evaluation of the SZJ SKP effectiveness must rely on the assessments of the quality assurance of each quality management process. It is necessary then to determine the quality requirements that they have to meet.

The example of the quality assurance evaluation refers to the basic vehicle inspections process (fig. 2). Experts' assessment of the degree of the process quality assurance considered is presented in the table 4.

Parameterised criteria of the numerical assessment of the degree of the process quality assurance, represent input data for concept being developed by the authors of the effectiveness of the entire SZJ SKP, using artificial neural networks.

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PROCESOWY MODEL SYSTEMU ZARZĄDZANIA JAKOŚCIĄ STACJI KONTROLI POJAZDÓW

Streszczenie: W artykule przedstawiono metodologiczne zasady budowy procesowego modelu systemu zarządzania jakością Stacji Kontroli Pojazdów, ogólną formułę tego modelu oraz koncepcję oceny zapewnienia jakości procesów systemu zarządzania jakością na przykładzie procesu badań kontrolnych pojazdów.

Słowa kluczowe: system zarządzania jakością, model procesowy, Stacja Kontroli Pojazdów