Improvement as a component to connect the integrated management system in the automotive industry[3]

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Abstract

Globalization of markets, increased customer expectations, expanding competition in all areas of customer-supplier relationships are the factors, which force enterprises to highlight quality in their strategies, with this tendency expected to be even more dynamic in the future. Enterprise strategy specifies future orientation of the enterprise in the internal and external environments and assignment of tasks in terms of the quality, safety and environmental protection to all its areas, functions and employees. Meeting these demands is supported by integration of the systems of quality management, environmental management and occupational safety and health management. Therefore, the aim of this study is to present the indicated management systems, which cooperated within the common idea of continual improvement, with its creator being E. Deming.

Key words:

Integrated management system, ISO standards, continual improvement

JEL Classification: M54, J28

Introduction

Poland is one of the leaders in manufacturing of subassemblies and car parts in the Central and Eastern Europe. Furthermore, the automotive industry is one of the leading areas of the Polish industry in terms of investment expenditure, share in transport and level of production. A significant segment in the automotive industry in Poland is production of parts, subassemblies and car accessories. Based on the data from 2014, Poland is third (following Czech Republic and Slovakia) in terms of production of broadly understood car components, including windscreens, batteries, tires, electrical equipment or mechanical components of combustion engines. Most of manufactured goods are exported, with the major destination being Germany and the

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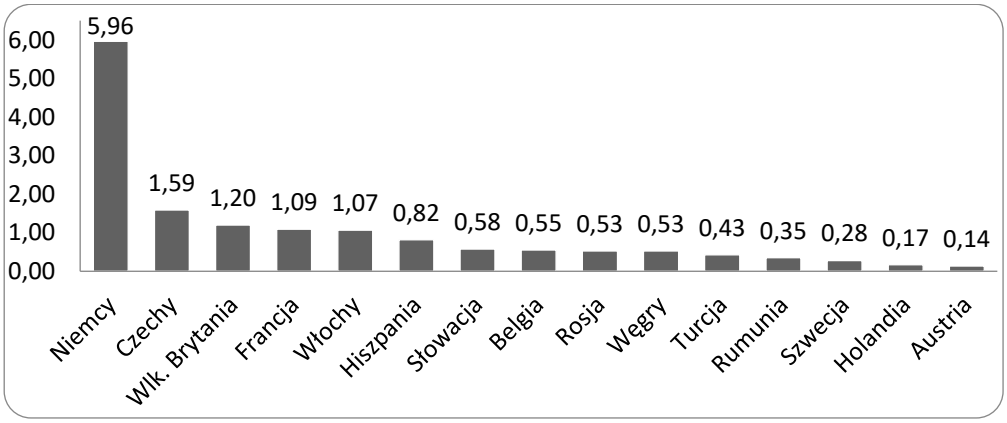
value of exported goods of 5.96 billion euro. The second place is taken by Great Britain, with the result of 1.20 billion euro, which is graphically presented in Fig. 1.

Figure 1 Main export destinations for car parts and accessories from Poland in 2014



Colums: value of goods exported to the country
Source: Report. Polski Związek Przemysłu Motoryzacyjnego 2015

1 Management systems and quality

The system is considered in the literature as a set of elements (components) with mutual relations occurring between each other and all the components connected directly and indirectly with others (Bielski, 2002). Therefore, the system represents a combination of the interdependent parts. It is characterized by such elements as:

- feedback,
- exchange with the environment,
- ability to achieve goals,
- equivalent exchange,
- development capabilities,
- capability of maintaining the dynamic equilibrium,
- increase in the role of auxiliary processes in performance of basic processes (Wawak, 2002).

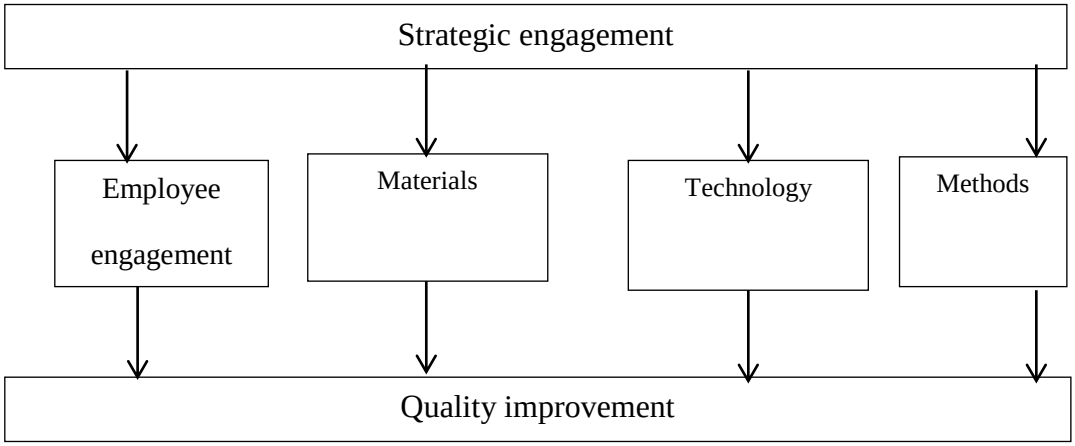
T. Borys finds that the management system represents a set of solutions implemented in the organization, its areas, helping effectively manage the organization (Borys et al., 2011).

The concept of "management" is considered in the context of resources. Enterprises are composed of the four basic resources including:

- information resources, i.e. data necessary for making accurate decisions,
- cash resources, viewed as a capital needed for current and future activities,
- human resources: managers with specific competencies and abilities, and production employees,
- material resources: materials and raw materials, equipment for offices and the offices as workplaces.

Human factor seems to be the most important of all these resources. This includes managers responsible for integration of individual resources in order to achieve aims and tasks set by the owners of the organization. In order to achieve this, they have to perform managerial functions, such as being team leaders, decision-making, organization and planning. Knowing individual roles of the top management staffs and with respect to the context of resources, management can be understood as manager's actions such as performance of the functions aimed at rational management of resources and achievement of the aims of the organization in an effective and efficient manner. With this approach, it is possible to improve efficiency and reduce production cost. Therefore, the organization should strive for improving the quality of products according to the philosophy of continuous management, which is presented in Fig. 2.

Figure 2 Diagram of comprehensive quality management



Source: R.W., Gryffin, Podstawy zarządzania organizacjami, Wydawnictwo Naukowe PWN, Warsaw, 2006.

The starting point to the improvement in quality is strategic engagement of the top managers. This is of key importance, since quality is not an abstract construct in the organization but the value that can be measured. Therefore, it is essential that the need for changes is adequately highlighted in the organizational culture. This leads to measurable consequences, and the funds have to be spent on the development and modernization of current equipment. The real outcomes cannot be reached if managers use the concept of quality as a slogan rather than the real goal. Another important point is employee engagement. Implementation of a specific plan to improve quality in an area or a department in the organization involves delegating authority and responsibilities to individuals. However, the fact of performing a task is insufficient since it will not be performed at an adequate quality level. Materials are understood as increasing the quality of raw materials used in the organization for production. Furthermore, it is important that the requirements imposed on the suppliers of subassemblies or parts should be higher to adjust to customer expectations. Technology is mainly focused on updating the software and automation of production. It is known that machines are more precise and have greater level of repeatability than

people. The resources as a method mean conversion of the expenditures into an effective product. All these factors are conducive to the improvement in the quality in the organization (Gryffin, 2006).

2 Standards and improvement in the automotive industry

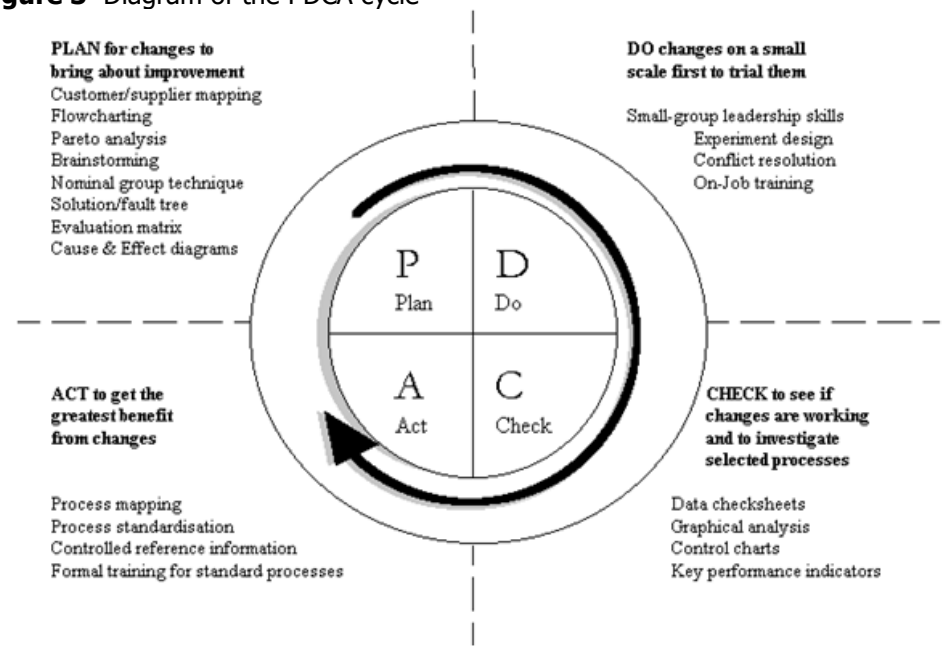
In the automotive industry, ensuring the quality at top level becomes the most important factor that allows for competition between world automotive leaders. Therefore, it seems legitimate to focus attention of each organization of the quality and constant improvement in the requirements using the standardized management systems which, if consistently implemented into individual areas of organization, form an integrated management system.

The requirements for three systems concerning the above quality categories were discussed in the standards:

- PN-EN ISO 9001:2009 Quality management systems. Requirements. The importance of the ISO/TS 16949 standard based on ISO 9001 to the sector should be emphasized.
- PN-EN ISO 14001:2005 Environmental management systems. Requirements with guidance for use,
- PN-N 18001:2004 Occupational safety and health management systems. Requirements.

The idea of the quality management systems, environmental management systems and occupational safety and health management systems is based on the concept of continual improvement, with its originator being Edwards W. Deming. The so-called Deming cycle is presented in Fig. 3.

Figure 3 Diagram of the PDCA cycle

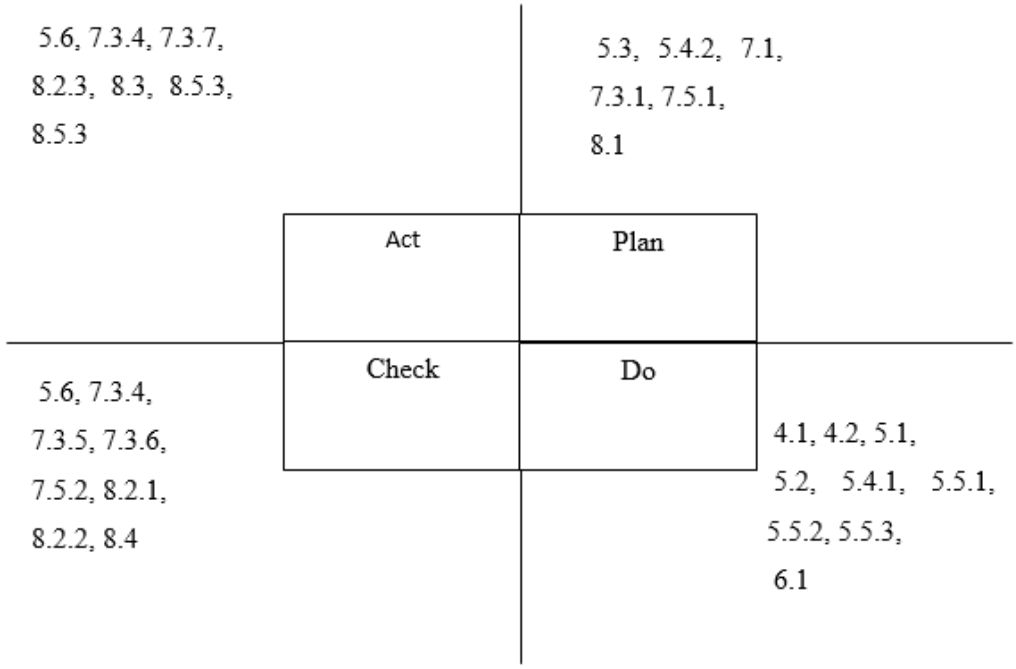


Source: http://www.hci.com.au/hcisite3/toolkit/pdcacycl.htm

2.1 Standard from the family of ISO 9001 and its extension for the automotive sector

The standard is distinguished by the use of the process approach. It was assumed that customers and other parties such as society or stakeholders perform the most important role in creation of the input data to the quality management system. It is satisfaction of the consumer that is the most basic information for the organization about meeting the product requirements, which should be monitored. Even if the customer is unable to specify the requirements, the organization should examine and specify them on its own. There should be also a feedback in the organization between the level of customer satisfaction and evaluation of its measurement (Sikora, 2010).

Figure 4 Relationship between the PDCA and the ISO 9001 standard



Source: A. Hamrol, Zarządzanie jakością z przykładami Wydawnictwo Naukowe PWN, Warsaw, 2007.

The figure shows that the individual points in the standard are referred to specific steps in the PDCA cycle. This makes it easier to work and perform assigned tasks and achieve the goals set in the organization.

In the context of the present investigation, it should be emphasized that one of the currently leading standards used in quality management in the enterprises of the automotive sector is technical specifications ISO/TS 16949. The set of guidelines specified in the ISO/TS 16949 for the automotive sector in relation to the commonly known and used quality standard of ISO 9001 represents the basis for the quality management system of almost each enterprise in the automotive sector.

As a document, ISO/TS 16949 is composed of 2 parts: requirements of the ISO 9001 standard, which determine the quality management system used in the enterprise and specific technical requirements which specify additional guidelines

typical of the automotive sector. Specific technical specifications emphasize meeting the customer expectations, which is the precondition for successful certification in the enterprise that is implementing the system. They can concern e.g. methodology and method of accepting the production details, methods to solve problems connected with quality and rules for performing the internal audits for products and auditor competencies (Sikora, 2010). The international quality management standard ISO/TS 16949 can be awarded to suppliers of:

- raw materials and materials needed for production (OE),
- replacement parts (OES),
- assembly or thermal processing,
- coating,
- painting and other forms of surface treatment (Łuczak, 2008).

The priorities for this technical specification include:

- control and improvement of each stage in the product life cycle, preventing from defects and allowing for a smooth flow of products in the manufacturing processes,
- quality of components of products proportional to the quality of finished product specified by the customer,
- measurability of the quality and manufacturing goals and their recording necessary for the analysis, continuous control and decisiveness with respect to the actions taken in the enterprise (Łysiak, 2013).

Numerous specific requirements, which should be implemented according to ISO/TS 16949: 2009 are nothing else as a set of various tools, methods and solutions which should be used within the quality management system in the enterprise. Some of the specific requirements of this technical specification were contained in Table 1.

Table 1 Specific requirements of the automotive sector in ISO/TS 16949:2009

No.	Specific requirement	What does this mean?
7.1.1 7.1.2	Criteria of acceptance	In order to avoid obtaining inconsistent products, the technical specification, as early as at the stage of product design, imposes the necessity of consultation between the design office and customers in order to adjust the product to their expectation, with particular focus on meeting special characteristics which have to be supervised and represent the element of the plan of enterprise quality management.
7.3.1.1	Interdisciplinary approach	It is required at each stage of the technological process in order to immediately detect the potential defects resulting from product design process and obtaining the analysed input data necessary for further stages of planning and manufacturing.

7.5.1.4	Comprehensive system of preventive maintenance	ISO/TS 16949 imposes the obligation of implementation, documenting and acceptance of the comprehensive preventive system. This means taking measures to eliminate the causes of failures of machinery and equipment and unplanned stoppages.
6.3.1	Production process layout.	Technical specification requires creation of process layout, i.e. the production process plan, control plan, development of the data on measurability, reliability and process quality.
7.5.1.2	Standard operating procedures	Obligations to use standard operating procedures at workplaces where processes that affect product congruence with customer requirements are performed.
7.6.1	Statistical measurement system	ISO/TS 16949: 2009 requires the use of the statistical measurement system to immediately develop reaction plans (activities including e.g. stopping the production and 100% product control) in the case of even the smallest deviations.
8.3.1	Classification of inconsistent products	In the case of the smallest inconsistencies, the product should be classified as inconsistent and evaluated during the review of the rejected components.
8.5.2.1	Problem-solving process	If the inconsistencies are detected, managers should start the problem-solving process which allows for recognition and elimination of the reasons.
7.3.6.3	Deviation of the product from the accepted plan	In the case of the noticeable defect despite the attempt to eliminate it, managers can turn to the customer with the request to accept the defect. If it does not generate much reservations, the enterprise receives customer's acceptance for product deviation from the assumed plan.
8.2.2	Internal audit	Internal audit has to be conducted for the process, product and the quality management system in the enterprise.
7.5.1.1	Control plans	According to the technical specifications, control plan should be developed for each product while taking into consideration the three phases: prototyping, pre-batch production phase and batch production phase.
7.5.1.2	Standard operating procedures	Each workplace should be equipped in standard operating procedures, especially in the case of the processes that have an effect on product consistency with the enterprise standards and requirements.

8.1.1	Statistical process control	It is required that the enterprise implements adequate statistical tools for each process (the most frequently used statistical tool in the automotive sector is statistical process control, SPC).

Source: Łysiak, Specyfikacja techniczna ISO/TS 16949, „Problemy Jakości", No. 10, Warsaw 2013.

In conclusion, the focus of the technical specification ISO/TS 16949 is on prevention rather than detection of the errors in the manufacturing process. Therefore, it is necessary that the quality management systems in the enterprises from the automotive sector allow for the supervision over the quality of the production process at each stage and be easy to interpret and coherent. This means that in an enterprise from the automotive sector, quality management system should ensure cooperation between enterprises that ensure the liquidity of the international supply chain in this area, which is critical to the improvement and integration with other areas of quality management, environmental management and occupational safety and health management within a coherent integrated management system in the organization, based on the concept of continual improvement.

2.2 ISO 14001 and PN-N 18001 standards as components of the management system

The success of the standards from the ISO 9000 family has contributed to the attempt to develop a similar system, which would make it easy for the organizations to manage the activities that have an effect on the natural environment. While implementing the environmental management system according to the ISO 14001 standard, organizations aim to systematize activities in order to minimize the negative impact of their activity on the environment. However, this is not the only goal of the enterprise that aims to implement the discussed system. The enterprises also want to demonstrate to the public opinion that they strive for changes and send a signal that the enterprise wants to be environmentally friendly. This leads to the improvement in relations with local communities.

The ISO 14001 standard and its guidelines do not specify the acceptable emissions of pollutant. The organization determines them on its own while respecting current legal regulation in a country. Furthermore, the characteristics of the management system that have a key effect on the environmental protection are specified. The standard obliges to continuous tracking and respecting legal regulations which can be used in a country. The motivation for implementation of the environmental management system is legal regulations. If they are not respected, the consequence can be financial penalty fees and losing customers' trust.

The activities that should be taken by the organization in order to implement environmental management are composed of the following steps:

- implementation of the environmental policy, and, therefore, activities to protect the environment with the definition of the environmental objectives,
- development of the plan in order to implement the environmental policy, which contains:

- Identification of the environmental aspects, i.e. elements that can have an impact on the environment and the ways by which this impact is reflected.
- Legal requirements that refer to the environment itself.
- Program and tasks that lead to the achievement of the aspects identified in the organization.

- measurement, monitoring and evaluation of environmental activities,
- system improvement by performing inspections and taking corrective and preventive measures.

Organizations define the environmental aspects, which result from their activities, and choose the most important ones, using the following criteria (Hamrol, 2007):

- level of the effect of an aspect on the environment,
- legal regulations,
- costs and difficulties resulting from changes of the effect on the environment,
- effect of change on other activities and processes,
- social reception of the organization.

Another important element of the organization management system is the PN-N 18001 standard that defines the occupational safety and health management system and is understood as part of overall organization management system. The standard is a Polish standard and is not directly linked to the family of the ISO standards. PN-N 18001 specifies the organizational structure, planning, responsibilities, procedures and defines the inspections and the occupational safety and health policy in the organization. The provisions of this standard allow for:

- evaluation of the effect on the working environment,
- precise characterization of the potential threats and methods to eliminate them,
- preventing failures and accidents at work, which represents a constant and important element of the system.

Organization that operates based on the provisions of the standards in order to improve working safety take e.g. the following actions:

- conduct regular audits of the working safety,
- examine the causes of accidents and events with accident potential,
- perform observation of workplaces,
- provide a complete information about the failures of machinery and equipment,
- define and evaluate risks involved in individual workplaces,
- equip employees in adequate protective equipment,
- contribute to raising awareness through training (Urbaniak, 2007).

In conclusion, it should be emphasized that the presented standards were developed in the idea of continual improvement using the Deming cycle, as shown in Figure 2. This offers opportunities for full integration of the management system based on PN-EN ISO 9001, PN-EN ISO 14001 and PN-N-18001 standards.

2.3 Integration of the system for management of quality, environment and occupational safety

Integrated management system is composed of the three interacting and supplementing each other subsystems in the enterprise: quality management system, environmental management system and occupational safety and health management system (PN-EN ISO 9001, PN-EN ISO 14001 and PN-N-18001).

These areas can be viewed separately, but as individual systems are implemented, the mutual permeating and linking can be observed. Therefore, the concept of integrated management system that connect them with each other is very popular (Urbaniak, 2010). Management in the area of quality, environment and occupational safety and health occurs according to the same principles which were introduced for the first time in the ISO standards of the 9000 series (Łańcucki, 2010).

Many requirements of the ISO 9001 standard are the same as the requirements of the ISO 14101. Similar pattern can be found for the requirements of the PN-N-18001 standard. Similar principles are used in the management of these systems, of which the key elements are (Bagiński, 2010):

- policy and planning,
- organization and staff,
- methods to transfer information,
- evaluation.

1.

The substantial impact on the integration of management system is from the process approach, which was firmly accentuated in the ISO 9001:2015, standard, which ensures even better compatibility with the ISO 14001 and PN-N 18001, and makes it possible to integrate these systems (Łuczak, 2007). Comparison of the requirements of the systems for quality management, environmental management and occupational safety and health management is presented in Table 2.

Table 2 Comparison of selected requirements of the systems for management of quality, environment and the occupational safety and health

Quality management	Environmental management	Occupational safety and health
Customer orientation	Environmental orientation	Employee orientation
Prevention concerning the responsibility for the product	Prevention concerning the responsibility for the environment	Prevention concerning the responsibility for the occupational safety and health
Quality improvement program	Environmental protection program	Program for improvement in conditions of the occupational safety and
Customer requirements	Legal and social requirements	Legal requirements

Quality policy	Environmental policy	Policy in the area of the occupational safety and health
Representative of the quality manager	Representative of the environmental manager	Representative of the occupational safety and health manager
Quality management system	Environmental management system	Occupational safety and health management system
Quality manual, documents and regulations	Documents and regulations	Documents and regulations
Quality training	Environmental protection training	Occupational safety and health training
Physical, financial and informational resources needed for implementation of the quality program	Physical, financial and informational resources needed for implementation of the environmental program	Resources: physical, financial and informational, necessary for the program of improvement in safety
Technical and measurement equipment	Technical and measurement equipment	Technical and measurement
Disciplining the processes concerning services for customers	Disciplining the processes connected with environmental protection	Disciplining the processes connected with ensuring safe and healthy working
Procedures for products inconsistent with the requirements	Procedures for emergencies and disasters	Post-accident procedures
Internal quality audits	Internal environmental audits	Internal occupational safety and health audits
Corrective and preventive measures	Corrective and preventive measures	Corrective and preventive measures

Source: J. Bagiński (red.), Menedżer jakości. Jakość, środowisko, bezpieczeństwo, Wyd. OWPW, Warsaw, 2000.

Conclusion

Implementation of the Integrated Management System is the most effective solution in the organizations, which intend to implement several different management system. Depending on the sector and objectives, which the enterprise wants to achieve over a specific time, the enterprise implements the integrated management system composed of several subsystems. The basis for the most of such projects is the Quality Management System consistent with the requirements of the ISO 9001

standard. Integration mostly concerns two or three selected systems. Many enterprises integrate the quality management system with the environmental management system ISO 14001, occupational safety and health management system PN-N/OHSAS 18001, information safety management system ISO 27001, or sector systems such as: ISO 22000, ISO/TS 16949 etc.

The implemented and certified integrated management system contributes to:

- a more harmonious and dynamic development of the enterprise,
- minimization and optimization of the costs connected with implementation and maintaining the system: opportunities for simultaneous certification and supervision over the system and, consequently, increased profits and profitability,
- improved work organization, unequivocal definition of the tasks, competencies and responsibilities of employees and their readiness to meet the customer requirements,
- organization and elimination of the doubling activities in all the areas of the enterprise and reduction in internal inconsistencies,
- effective management of the resources,
- unification due to the reduction in the amount of documents: relations between each other in a transparent and logical manner, also for the processes related to different systems,
- increased flexibility in introduction of changes,
- facilitation of management and activities and creation of the basis for promotion of the TQM (Total Quality Management) idea in the enterprise,
- facilitation in meeting legal requirements and ensuring quick adjustment of internal regulations to changes occurring in current legal system,
- promotion of the positive corporate image among customers, suppliers and society or the state's supervision entities,
- higher reputation and trust.

References

1. Bagiński J. (ed.): *Menedżer jakości. Jakość, środowisko, bezpieczeństwo*. Warszawa: Wyd. OWPW, 2000. 384 s. ISBN 83-7207-223-X.
2. Bielski M.: *Podstawy teorii organizacji i zarządzania*. Warszawa: C.H. Beck, 2002. 231 s. ISBN: 83-7387-441-0.
3. Borys T., Rogala P., (ed.): *Zintegrowane systemy zarządzania jakością i środowiskiem*. Wrocław: Wyd. Akademii Ekonomicznej, 2011.
4. Gryffin R.W.: *Podstawy zarządzania organizacjami*. Warszwa: Wydawnictwo Naukowe PWN, 2006. 826 s. ISBN 83-01-12019-3.
5. Hamrol A.: *Zarządzanie jakością z przykładami*. Warszawa: Wydawnictwo Naukowe PWN, 2007. 556 s. ISBN: 9788301153748.
6. Łańcucki J.: *Trzy filary zrównoważonego rozwoju. Metrologia, ocena zgodności, normalizacji*, in: Znormalizowane systemy zarządzania, J. Łańcucki. Poznań: Wyd. Uniwersytetu Ekonomicznego, 2010. 13-27 s. ISBN: 978-83-7417-519-7.

7. Łunarski J.: *Zintegrowane systemy zarządzania. Wspomaganie zarządzania systemami standardowymi*. Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej, 2011. 243 s. ISBN: 978-83-7199-650-4.
8. Łuczak J., Matuszak-Flejszman A.: *Metody i techniki zarządzania jakością. Kompendium wiedzy*. Poznań: Quality Progress, 2007.
9. Łuczak J.: *System zarządzania jakością dostawców w branży motoryzacyjnej – ocena stotności wymagań*. Poznań: Wydawnictwo Akademii Ekonomicznej w Poznaniu, 2008. 275 s. ISBN: 978-83-7417-372-8.
10. Łysiak D.: Specyfikacja techniczna ISO/TS 16949. In: *Problemy Jakości*, 2013. ISSN 0137-8651, No. 10,
11. Sikora T.: *Wybrane koncepcje i systemy zarządzania jakości*ą. Kraków: Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, 2010. 368 s. ISBN: 978-83-7252-483-6.
12. Urbaniak M.: *Zarządzanie jakością środowiskiem oraz bezpieczeństwem w praktyce gospodarczej*. Warszwa: Centrum Doradztwa i Informacji Difin sp. z o.o., 2007. 504 s. 978-83-7251-785-2.
13. Urbaniak M.: *Kierunki doskonalenia systemów zarządzania jakością*. Łódź: Wyd. UŁ, 2010. 454 s. ISBN: 9788375254273.
14. Wawak T.: *Zarządzanie jakością. Teoria i praktyka*. Gliwice: Wyd. Helion, 2002. 272 s. ISBN: 8373617876.
15. http://www.pzpm.org.pl/Rynek-motoryzacyjny/Roczniki-i-raporty/Raport-branzy-motoryzacyjnej- 2015 [22.05.2017]