

TOYOTA-ORIENTED TECHNOLOGIES AS ECOLOGICAL MANAGEMENT TOOLS FOR TRANSPORT ENTERPRISES

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Abstract: The authors studied the managing principles for running a modern transport enterprise. In research process the experience and results of foreign scientists were analyzed and different company management tools were compared. Special focus is given to ecological approach due to crucial relevance of environmental problem. In this connection, the importance of Toyota technologies and BOST method, created by a Polish scientist Borkowski S., is emphasized. The research has been carried out for transport enterprises, which are high-demand in any country of the world. The case study is the largest Russian railway company – JSC Russian Railways. As the result, the guidelines to the improvement of management principles for JSC Russian Railways have been developed.

Key words: Toyota principles, BOST method, environmental management, transport industry enterprises, survey

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Introduction

Currently, the task of a superior of any enterprise is to use state-of-the-art administrative methods enabling cutting company costs and making enterprise operation smooth, effective and green. At the time, the issues of environmental management are given great importance in various companies of the world.

Active discussion of ecological problems began in Rio de Janeiro in 1992 at the UN Conference devoted to the Environment and Development (Proceedings of the United Nations Conference on Environment and Development, 1992) and now the solution of these problems are starting to occupy an increasingly prominent place in management. As adopted at the Conference "Agenda of the XXI century" states, the environmental management should be attributed to the key dominant of sustainable development and higher priorities of industrial activity and entrepreneurship.

Nowadays, humanity in its development "forces itself into a corner" by ignoring the solution of environmental problems, which reinforces the relevance of the issue. V.I. Vernadsky (1988), N.N. Moiseev (1990) and other scientists (Abdeev, 1994; Treasurers and Spirin, 1991; Teilhard de Chardin, 1987) consider that ecological problems have reached the planetary and even interplanetary importance level.

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The global economy, including Russian economy, is increasingly becoming ecologically dependent. Further, not only economic relations but also humanitarian ties of different countries will depend of the level of acceptance and actual implementation of the international environmental standards, which are becoming higher every year. Time is a crucial factor. Ecologization of production and culture of the country – it is a long and expensive matter, and the more it is delayed, the more expensive it will cost to society.

The above mentioned issues are actual, extensional and multidimensional. They can only be solved in a synergy team of scientists from different countries, with the approach based on strong methodological and theoretical understanding of ecological concepts and with reference to specific sectors of the economy, in our case – to the transport sector.

In this connection, the authors hypothesized that the need to implement the principles of lean production or Toyota's principles into the environmentally oriented management of businesses in any industry, but the emphasis is placed on the transport industry, as the industry, which is present in every region of the world.

Literature Review

During the last decade Russia has been facing the kinds of problems, mentioned above, which made them relevant for scientific investigation using the best world expertise. The issues of environmental management in transport have been studied by scientists from different countries. So a team of scientists from the University of Lublin (Bajec et al., 2012) and the Silesian University of Technology (Łachacz and Śładkowski, 2011) studied the potential positive effects of the use of standards for investments in environmentally friendly transport. They also analyzed the relationship between logistics and supply chain efficiency and quality standards. Particular attention was drawn to the ISO 14001 standard, as an effective tool to increase the sustainability of transport and logistics services. First, the stimuli and stabilizers of environmentally safe logistics were investigated. Second, we studied the level of investments for environmental logistics. Additionally, the potential positive effects of the use of standards for investments in environmentally friendly job were studied (Śładkowski, 2012).

Scientists from Romania (Angheluta and Costea, 2011) summarized the experience of environmental management solutions for some of the agglomerated regions and countries, and developed a business plan for the implementation of the principles of environmental management in the structure of urban transport of Istanbul.

Scientists from the Czestochowa University of Technology worked in the direction of seeing to the necessity of changing the environmental management strategy, the concept of sustainable development and waste minimization problem as one of the elements of the strategy (Karia and Wong, 2013; Tabor, 2014; Ingaldi and Dziuba, 2015; Kot, 2015).

The activity of implementation above mentioned methods in North American region is described in the report (Successful Practices of Environmental Management Systems in Small and Medium-Size Enterprises, 2005). In this document the application and future directions of environmental management systems in Canada, Mexico and the United States are investigated. Special attention in solving the problems is paid to leasing with governmental sectors, technical assistance, incentive programs and policies.

The analysis of the using green, ecologically-friendly technologies is being carried out in the works of Russian scientists as well (Zhuravskaya and Anashkina, 2015, Antropov and Morozova, 2014, 2015). In these studies, the readiness of the participants of economic relations to pay more for the introduction of environmental management is registered.

The research on responsibility of citizens (as potential employees) for waste management was carried out in Romania by Budică et al (2015).

Another important issue, which directly depends on the ways of administration, is company's competitiveness. Evaluation of external factors influencing the enterprise's competitiveness by Porter Diamond model was made by Roostika et al. (2015).

It is maintained that competitiveness could be reached by clustering, increasing product and service efficiency, reached by using of modern technologies and boosting quality.

Among the state-of-the-art methods contributing to company development and raising competitiveness is benchmarking, viewed by Goncharuk et al. (2015).

Thus, there are a great number of methods investigating different aspects of company administration process and leading an enterprise to be competitive and ecologically friendly. Each method highlights valuable sides of company management. The present article is written as a development of this theme considering all the variety of authors' management approaches, but with a special focus on ecological safety. It is further continuation of profound research of a Polish scientist Stanislaw Borkowski. In 1999, he proposed his own method - BOST (the name is formed by the first two letters of the name and surname of the scientist), based on the Toyota management principles, which form the innovative production and quality management system (Borkowski, 2012, 2013). Unless the principles of Toyota and BOST method combine both – new managerial techniques and eco-friendliness, they are taken as basic approaches for our scientific analysis.

Principles of Toyota and BOST Method

Toyota principles underlying the TPS (Toyota Production System) according to Mayer and Liker (Mayer and Liker, 2011) are neither corporate nor the national know-how, and are the result of the collection and systematization of best practices of world leaders.

Method BOST – a qualitative approach to research, which allows obtaining quantitative estimates for comparative analysis. The method is based on two groups

of independent parameters in the Cartesian coordinate system: the x-axis (X) – is the axis of the respondents, and the ordinate axis (Y) – is the axis of evaluation factors, where the scale is dependent on many factors, describing the specific principles of Toyota.

S. Borkowski offered to give the optimum level of knowledge to each member of a company staff. All the staff was divided into 2 groups: "Superiors" and "Employees" and a number of guidelines were identified for each of these groups (Table 1).

Table 1. Toyota management principles as modern enterprise administrating tools
(Borkowski, 2012)

Toyota principles		BOST method	
№	Description	Superiors	Employees
1	Long-Term philosophy	+	+
2	Continuous process flow	+	+
3	Using 'pull' systems	+	+
4	Leveling out the workload	+	+
5	Building a culture of stopping processes	+	
6	Tasks and processes standardizing	+	+
7	Visual control	+	+
8	Reliable, thoroughly tested technology	+	
9	Growing leaders	+	
10	Developing exceptional people and teams who follow your company's philosophy	+	
11	Respect towards extended network of partners and suppliers	+	
12	Personal understanding of the situation	+	
13	Making decisions slowly by consensus, thoroughly, considering all the options; implementing them rapidly	+	
14	Becoming a learning organization through relentless reflection and continuous improvement	+	+

Thus, only half of principles are suggested to be used for subordinates in BOST method. This method has been approved for 1500 Polish enterprises and gave good results (Borkowski, 2012, 2013; Noga and Ptak, 2015). Many organizations around the world use benchmarking – the process of identifying, understanding and adapting existing examples of effective company functioning in order to improve their own work (Zhuravskaya, 2013). That is why the authors of this article consider the experience of Polish colleagues useful and found it interesting. And in general, the approach: "The optimal level of knowledge for each employee" described in the BOST-method, especially at the initial stage – the stage of transition to the principles of lean production – is believed to be right. The largest Russian company – JSC Russian Railways (RZD) was taken as the object of study.

Follow-up on the Issue in JSC Russian Railways

In Russia, the environmental benefits of rail transport in comparison with other modes of transport are provided by the use of electric traction, which eliminates the pollution areas adjacent to railroads. In JSC Russian Railways the electric traction is used for transportation of more than 85% of cargo and 80% of passengers.

Low polluting component of rail transport emissions is directly linked to energy efficiency. Specific consumption of fuel and energy resources by rail transport is much lower than that by road and air transport. But at the same volume of energy consumption rail transportation performs significantly larger volume of freight shipment. And the energy efficiency of rail transport is several times higher than of road or air modes both in freight and passenger transportation (Environmental Strategy of JSC Russian Railways for the period until 2017 and until 2030).

As part of JSC Russian Railways Environmental Strategies during the period up to 2015 such results have been achieved: the reduction of harmful emissions into the atmosphere from stationary sources, reducing greenhouse gas emissions, the reduction of polluted wastewater discharges into surface water bodies, as well as increasing the share of recycled general waste.

In the area of corporate environmental management in the Environmental Strategy of JSC Russian Railways the key element is the introduction of unified corporate guidelines and regulations in compliance with Russian environmental legislation, GOST R ISO 14001-2007 (ISO 14001-2004), and with rating criteria of 500 environmentally friendly companies in the world (according to Newsweek magazine).

Thus, the results of JSC Russian Railways activity show that the superiors of the largest rail enterprise in Russia follow the principles of environmental management and developed 10 ethical principles for RZD employees (Table 2).

Let us compare the principles of JSC Russian Railways for employees with the principles of Toyota and BOST method (Table 2).

Table 2. Comparative analysis of the principles

Principles		
Toyota – BOST (superiors)	BOST (employees)	JSC RZD
1. Long-Term philosophy	+	To glory in being the employee of JSC Russian Railways
2. Continuous process flow	+	To focus on results
3. Using ‘pull’ systems	+	To comply with the commercial interests of JSC Russian Railways
4. Leveling out the workload	+	
5. Building a culture of stopping processes		To do good work (quality consideration)
6. Tasks and processes standardizing	+	To work with a foundation on high professional skills and existing standards
7. Visual control	+	

8. Reliable, thoroughly tested technology		
9. Growing leaders		To be a leader
10. Developing exceptional people and teams who follow your company's philosophy		To feel themselves as part of a whole
11. Respect towards extended network of partners and suppliers		To prioritize the humans
12. Personal understanding of the situation		
13. Making decisions slowly by consensus, thoroughly, considering all the options; implementing them rapidly		To make well-considered decisions
14. Becoming a learning organization through relentless reflection and continuous improvement	+	To streamline the operation processes

The analysis showed that ethical principles developed by JSC Russian Railways are generally consistent with the principles of Toyota and BOST. For example, five of the fourteen principles of Toyota, are used by all the participants of this study, they are the principles of Long-term philosophy, Continuous process flow, Using 'pull' systems, Tasks and processes standardizing, Becoming a learning organization through relentless reflection and continuous improvement.

It is interesting to note that the three Toyota principles related to the quality (5th, 7th and 12th) are supported by only one principle of JSC Russian Railways – To do good work (quality consideration), which is not specific and does not contain evaluation criteria that affects the assessment of the quality of work.

Talking about the quality of the work is necessary to note, that the 4th principle (Leveling out the workload) is present in Toyota – BOST (superiors) and BOST (employees), and is absent in the JSC Russian Railways principles. However, regularity and consistency in the work is, from our point of view, is a necessary condition for the effective operation of any organization and especially such corporation as JSC Russian Railways. The authors believe that this principle must be included into the list of ethical principles of the Russian transport corporation.

In the context of the greening of society and increasing technological sustainability and reliability of functioning in any field of activity, the 8th Toyota – BOST (superiors) principle Reliable, thoroughly tested technology can be regarded very important. Reliable technology is considered in terms of traffic safety and failure-free operation of machinery and electronics, cutting the negative impact on the environment and humans.

This technology must provide the use of environmentally friendly materials, reduce noise, vibration and polluting emissions, enable careful handling of energy. The concerned principle performs an important role in company management. At JSC Russian Railways a lot has been done in this direction and a lot is planned in the future (Environmental Strategy of JSC Russian Railways for the period until 2017 and until 2030), but the work needs to be strengthened. This will help

the corporation to achieve sustainable development on the basis of efficient management principle much faster.

Methods and Results

In order to study the importance of ecological management implementation and involvement of personnel into company operation process the survey was carried out during 2014 – 2015 within the framework of the international project TEMPUS «RECOAUD». The listeners of a retraining course in the Ural State University of Railway Transport (Yekaterinburg) - transport sector employees - were suggested to answer an oral interview and an open written questionnaire. The survey had also the implicit aim to check the effect of Toyota and BOST principles for Russian transport companies. 160 people took part in the survey, including 100 JSC Russian Railways employees and 60 employees from other companies. The results of research are presented herein after. Figure 1a shows the distribution of the respondents by gender and age. Figure 1b presents the distribution of respondents according their educational level.

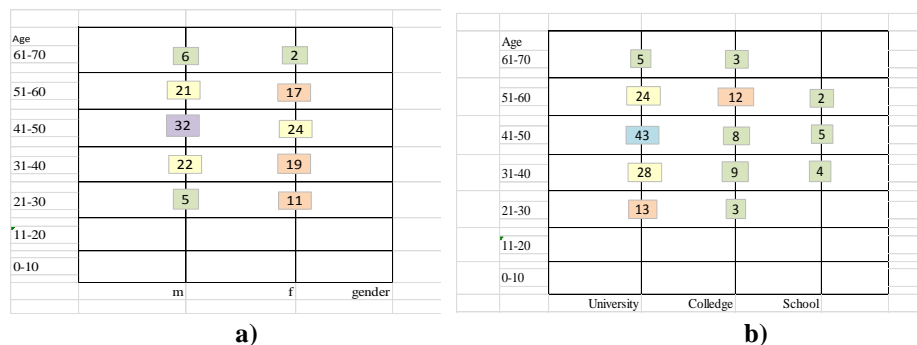


Figure 1. a) Distribution of the respondents by gender and age; b) Indication of respondents' educational status

The 1st issue in the questionnaire was whether there's the possibility of a global ecological catastrophe. Most JSC Russian Railways employees (60%) responded "no", while the employees of other companies (83%) said "yes." The 2nd issue was to define the concept of environmental management and audit (EM&A). It revealed that employees of Russian Railways see EM&A as the analysis of human influence to the environment and employees of other companies – as management and control of the environment state. The 3rd issue was connected with EM&A system for the enterprise running. Thus, 80% of all respondents are concerned that it is not important for the enterprise management.

In spite of not a very large amount of respondents, it can be resumed that ecological culture of the transportation industry employees of the Russian Federation should be improved with adapting the legal regulations of the state, aimed at improving environmental safety, implementing the need to form a new

ecological worldview of a modern superiors and employees.

Great interest was aroused by the answers to the 8th questionnaire question: *Please rank the importance of Toyota principles for the modern enterprise management (put "+" signs for the principles that should be applied in running the enterprise and be important for employees and managers)*. The results of the survey are presented at Figure 2. In general, the respondents confirmed the importance of Toyota and BOST-method principles for the management of a modern enterprise.

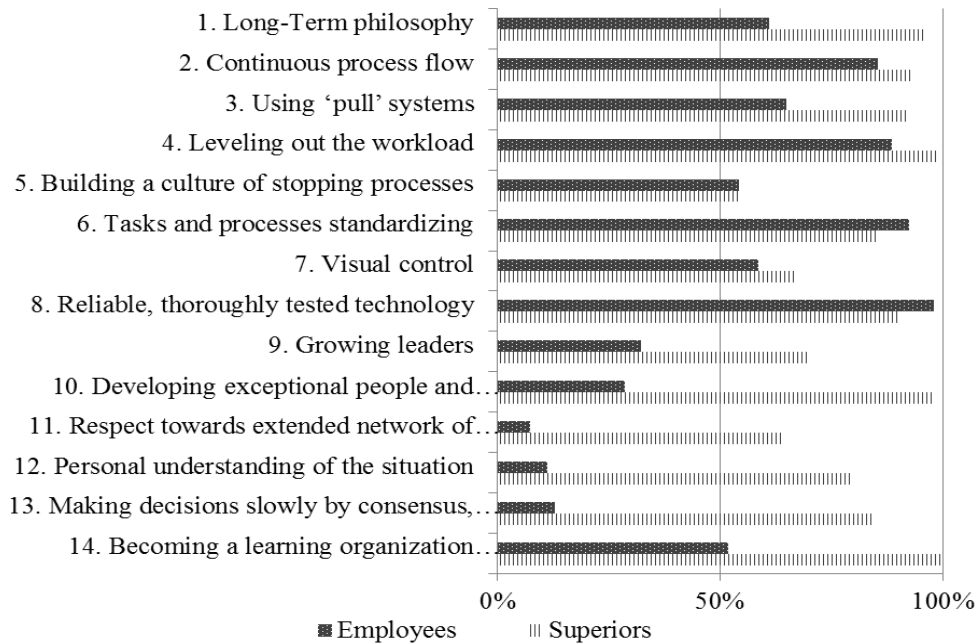


Figure 2. Evaluation of Toyota and BOST-method principles in modern enterprise management by Russian employees and superiors

The analysis showed that the principles of the leaders of Russian transport companies on the whole do not differ from the principles of Toyota and BOST (superiors), which is cannot be said about subordinates – great involvement was showed by employees in following principles 5, 8, which are not relevant for employees with BOST (employees). In general, principles 8, 6 and 4 had the maximum number of votes. Principle 6, Tasks and processes standardizing was already included into 10 ethical principles for RZD employees. But, principle 4 Leveling out the workload (superiors – 99 %, employees – 89 %) and principle 8 Reliable, thoroughly tested technology (superiors – 98 %, employees – 90 %) showed their considerable importance for Russian employees and superiors and, therefore, should be included into the list of 10 ethical principles for RZD employees.

Currently, company administrative bodies pay great attention to the maintenance and improvement of enterprise management system and increasing its efficiency. The authors believe that the business personnel policy based on the principles of lean production, science-based strategy and sustainable development should operate both at the level of a superior and employee (Antropov and Morozova, 2015). And growing an employee with the correct ecological worldview – is the basis for efficient management of a modern enterprise.

Conclusions

The major points covered by this paper may be summarized as follows. First, at the present stage of management development enterprise employees should be better informed about the necessity of quality standards and environmental management systems implementation. Questionnaire results support the supposition that employees do not always fully understand, and often are not aware of the technologies and the methods used. This reduces the efficiency of investment, and therefore the efficiency of enterprise management as a whole, which is unacceptable in the conditions of economic recession.

Second, it is necessary to organize continuous training for all employees of the enterprise for the purpose of not only formal reporting on the implementation of standards, but the real work towards improving the quality of customer service and sustainability of the production process.

Third, at the stage of students' study the special courses on environmental management and audit must be introduced. Thus, future superiors and employees will easily enter the production process with correct fulfillment of their responsibilities and taking right management decisions.

Finally, this study showed that the implementation of BOST-method and Toyota-oriented technologies is applicable and relevant for the Russian companies' management and for the international research. The authors found out that more than half of the Russian rail companies' employees chose the following principles as a base for their work: Becoming a learning organization through relentless reflection and continuous improvement, Long-Term philosophy, Continuous process flow, Using 'pull' systems, Leveling out the workload, Building a culture of stopping processes, Tasks and processes standardizing, Visual control.

Logically, the authors point out practical relevance of this article to be connected with providing ecological management literacy for employees, which will allow them to justify the methods of increasing the level of ecological safety of production and consumption processes, and minimize environmental risks. The effect will be achieved by increasing the sustainability and livability, maintenance biodiversity and wealth of natural resources, taking into account the interests of present and future generations. It would be of great interest to further develop the issues connected with participation of different gender, age and educational status groups in managerial process, as well as their attitude to company green initiatives.

For the authors "*Environmental management – is a part of general administrative system, realizing the value orientation towards sustainable development, which includes the organizational structure, the optimal ecological and economic planning, responsibility, methods and resources sufficient for developing, implementing, achieving, reviewing and maintaining the organization in the field of environmental policy*".

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TECHNOLOGIE ZORIENTOWANE NA TOYOTĘ JAKO NARZĘDZIA ZARZĄDZANIA EKOLOGICZNEGO DLA PRZEDSIĘBIORSTW TRANSPORTOWYCH

Streszczenie: Autorzy badali zasady zarządzania związane z prowadzeniem nowoczesnego przedsiębiorstwa transportowego. W procesie badawczym przeanalizowano doświadczenie i wyniki zagranicznych naukowców i porównano różne narzędzia do zarządzania firmą. Szczególną uwagę poświęca się podejściu biologicznemu ze względu na kluczowe znaczenie dla problemu ochrony środowiska. W tym względzie podkreślone jest znaczenie technologii Toyota i metody BOST, stworzonej przez polskiego naukowca S. Borkowskiego. Badania przeprowadzone zostały dla przedsiębiorstw transportowych, które są dużym zapotrzebowaniem w każdym kraju na świecie. Studium przypadku to największa

rosyjska firma kolejowa - JSC Rosyjskie Koleje. W efekcie, opracowane zostały wytyczne do poprawy zasad gospodarowania dla Rosyjskich Koleji JSC.

Słowa kluczowe: zasady Toyoty, metoda BOST, zarządzanie środowiskowe, przedsiębiorstwa przemysłu transportowego, ankieta

豐田為導向的科技生態管理手段，為運輸企業

摘要：作者研究的管理原則運行的現代運輸企業。在研究過程中的經驗和外國科學家的結果進行分析的公司和不同的管理工具進行了比較。特別關注是考慮到生態的方法，由於關鍵的環境問題的相關性。在這方面，豐田技術和BOST方法中，通過一個波蘭科學家S. Borkowski創建的重要性，被加重。這項研究已進行了對運輸企業，這是在世界上任何國家的高需求。案例研究是俄羅斯最大的鐵路公司

JSC俄羅斯鐵路公司。結果，向管理原則JSC俄羅斯鐵路的完善的指導方針已經制。

關鍵詞：豐田原則，BOST方法，環境管理，交通運輸行業的企業，調查