

# DIGITALIZATION AS A FACTOR OF RISK MANAGEMENT IN A RESEARCH AND PRODUCTION COMPANY IN THE FIELD OF MOTOR VEHICLE EXAMINATIONS

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## Abstract

**Introduction:** The basic level of industry risk in the field of expert services remains unacceptably high due to the effect of a significant number of various factors. **Purpose of the study:** The authors study the influence of enterprise risk factors upon production digitalization in the field of expert services. **Methods:** The authors used content analysis for the software life cycle to assess the discount period for the net operating income of an enterprise upon the introduction of a system to evaluate the quality of developed software and switching to short iterations regarding sales. **Results:** Software implementation in the field of motor vehicle examination not only significantly improves the technical and economic performance of an expert organization but also complies with standards of business conduct in the information society in general.

## Keywords

Risk management, use of online programs for expert examination of road accidents, digitalization, special software.

## Introduction

Currently, a strong dependence on market conditions represents a major challenge for any company operating in the field of expert services. There are numerous management methods that make it possible to solve the challenges of companies operating in the field of independent forensic expert examination, and risk management represents their integral part. It should be noted that the basic level of industry risk in this economic segment remains unacceptably high due to the effect of a significant number of various factors such as the profitability level, cost of entrance to the market and exit from it, paying capacity of counterparties, weak market position of a new company, etc. Risk factors of companies operating in the field of expert services are described in various publications (Dearstyne, 2001; Strelets, 2008; Vorobyova, 2014) but the following key parameters shall be distinguished:

I. In terms of industry risks:

- fast technological changes in the field of expert services, which can result in increased costs for examination (including those related to examination quality improvement);

- a large number of available expert analysis methods and/or their fast implementation throughout the entire period of expert organization activities;

- high barriers to exit from the market: a small number of potential buyers of new developments due to high prices, strong competition, low profitability, and other factors;

- a significant influence of state authorities on the development of the expert industry: support of government-owned expert institutions (including the provision of a legislative framework, etc.).

II. In terms of management risks:

- lack of a clear strategic development direction, implementation of a risky investment policy, high operational risk, etc.

III. In terms of business risks:

- use of counterfeit software;

- lack of economic position analysis.

The consolidated industry risk associated with the activities of a company operating in the field of motor vehicle and examination can be attributed to the following types of economic activity (according to the Russian National Classifier, or OKVED): 72 (scientific research and development), 74 (other professional, scientific

and technical activities). According to the data of a risk analysis and management program located on the [www.checkbusiness.net](http://www.checkbusiness.net) website, these activities are characterized by the following consolidated industry risk indices (based on more than 50 factors):

- as of 01.04.2019, the industry risk index for 72 OKBED was 3.717532 out of 5, i.e. the industry is high-risk;
- as of 01.04.2019, the industry risk index for 74 OKBED was 3.6146104 out of 5, i.e. the industry is also high-risk.

### Purpose of the study

When an indicator for the availability of proprietary (or franchise) software developments is introduced in the matrix of industry risk indices, some factors cease their adverse effect and the consolidated industry indices for a particular organization decrease to 1.993211 and 2.7544 for 72 and 74 OKVED, respectively, moving to the category of medium-impact industry risks. These indicators can be achieved by changes in the rating of individual industry risk factors. For instance, in the “profitability in the industry” group, availability of proprietary software and databases decreases the value of the “strong competition in the industry” consolidated factor by 1 point, the value of the “availability of monopolists in the market or its individual segments” consolidated factor will be equal to 1, and the value of the “availability of substitutes” factor will be equal to 0. If proprietary methodological developments and software are available in a company, an issue of assessing the life cycle of intellectual deliverables is included in the process of enterprise risk management.

### Methods

The impact of the sales decrease factor in the presence of expert methods and software reduces proportionally to the level of program utilization process scalability and availability of programs to users. The impact of the factor of fast technological changes in the industry also significantly reduces to the minimum value. In the “conditions of entrance to the market and exit from it” group of industry risk factors, the impact of such key factors as “lack of qualified experts in the industry”, “significant influence of state authorities on industry development”, and “high barriers to exit from the market for investors” reduces. The impact of the group of factors describing the influence of competitors on the target audience also significantly reduces. Therefore, external market conditions become more favorable for the research and development area, and the consolidated risk index calculated within the framework of the rating model reduces to the safe value. This confirms a thesis by well-known American economist R. Coase (Coase, 1995) who asked why firms exist. His answer is as follows: a firm makes it possible to reduce transaction costs of market coordination. While the “spontaneous order” makes it possible to save transaction costs in large groups, hierarchy provides the same result in small groups, i.e. within the company organization. But due to modern information technologies, it is possible to reduce transaction costs in many sectors almost to zero (Strelets, 2008).

Reduction of the management risk factor weight in an expert organization when passing the barrier of venture investments in the development of software/databases or the procurement of franchises is conditioned by the fact that the software process cycle in the market of R&D services ceases to be unstructured and becomes associated with the software update frequency. In turn, intellectual services start to be considered as operations related to the use of software, i.e. the concept of “quality” is introduced, which is used as “the degree to which a set of inherent characteristics fulfills requirements” as defined in ISO 9000:2000 Quality management systems – Fundamentals and vocabulary. It is interesting to note that in this case such “degree” takes on the role of product limitation, bringing the field of expert services in the area of motor vehicle examination to the software industry, which is currently implemented in all expert activities management areas – from requirements management (“quality attribute” as a category of non-functional requirements) to testing of new technologies (such metrics as MTTF (mean time to failure) and MTBF (mean time between identified failures), etc.) (ITMO, 2016). It can be concluded that the simplification of interaction between the consumer and the manufacturer due to the capabilities of special software predetermines shift of the consumer interests from the long-term period to the short-term. Basically, it means the formation of a new organization essence within the framework of so-called “information profitability”, which means the ability of companies and other organizations optimally and systematically use information for achieving strategic goals as a way of integrating information skills of the company with those advantages that are provided by electronic forms of exchange (Dearstyne, 2001).

The lack of economic position analysis in management accounting is typical for all medium-sized organizations. However, this is one of the key factors in risk management analysis. Using an example of cost management in an expert organization, we will demonstrate a method of gaining additional profit that can be used to develop proprietary software and a database to enter the area of moderate or low risks. For instance, accounting of Net Operating Income (NOI) makes it possible to analyze whether opportunities for investing using internal (and not borrowed) reserves are available, which significantly affects payment risk factors and, as a consequence, the financial stability of an organization (Vorobyova, 2014). NOI for the sphere of expert services in the field of forensic expert examination can be calculated by the following equation:

$$NOI = C_e \cdot N \cdot 20 - C_r - O_{ex} - C_{tax} \quad (1)$$

where:  $C_e$  is the average cost of one examination,  $C_r$  is the cost of renting,  $O_{ex}$  are overhead expenses,  $C_{tax}$  are taxes,  $N$  is the number of examinations per day.

The value of an expert organization can be calculated for the period of investing in the development of proprietary software and a database using the following equation:

$$NVP = \sum_t^T 1 \frac{C_t}{(1+r)^t} \quad (2)$$

where: NVP is the business value,  $C_t$  is NOI from the first to the last applicable period,  $r$  is the discount rate. It should be kept in mind that the key task is to determine a method to assess the life cycle of intellectual deliverables, to which deprecated normative methods (such as program- and goal-oriented planning, inventory accounting, probabilistic models for asset retirement) cannot be applied. In this case, so-called content analysis in that knowledge area where software is used comes to

the forefront, i.e. management activities are transferred to the field of linguistic studies related to existing computer ontologies and work with AI (Gritz, 2018).

Let us consider an example of calculating the business value for five conditional periods with regard to one of the Saint Petersburg expert organizations. The calculation was used for two cases: without the development/use of software or a database, with the development/use of software and a database. In case an expert continues to perform calculations manually, the business value amounts to RUB 25,551,790 (Table 1).

Table 1. Calculation of the business value by NOI discounting

NOI	8,544,000	8,544,000	8,544,000	8,544,000	8,544,000
Cd	0.833333	0.694444	0.578704	0.482253	0.401878
Income	7,120,000	5,933,333	4,944,444	4,120,370	3,433,642
Business value					25,551,790

In case an expert ensures process automation, the business value amounts to RUB 39,045,432 (Table 2).

Table 2 .Calculation of the business value by NOI discounting

NOI	13,056,000	13,056,000	13,056,000	13,056,000	13,056,000
Cd	0.833333	0.694444	0.578704	0.482253	0.401878
Income	10,880,000	9,066,667	7,555,556	6,296,296	5,246,914
Business value					39,045,432

The obtained economic effect in the form of business value increase by RUB 13,493,642 makes it possible to make investments in the first stages of developing proprietary software and databases, not relying on borrowed funds. The simplified model of calculations shown for clarity demonstrates business value increase by 52.8% at the reduction of expert organization risk factors. Due to the development and implementation of online programs for road accident analysis, located on the accident.zone and dtpmaster.ru landing pages (Figures 1, 2), it became possible to reduce the time required for examinations by 50%, make additional labor and financial resources available, decrease internal transfers when several qualified experts were needed.

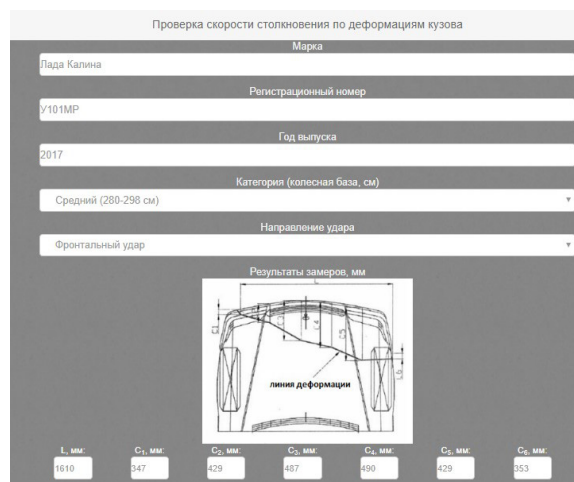


Figure 1. Module for the calculation of car speed (Vc) loss in relation to body deformation in the dtpmaster.ru environment (Tul'kin, 2015).

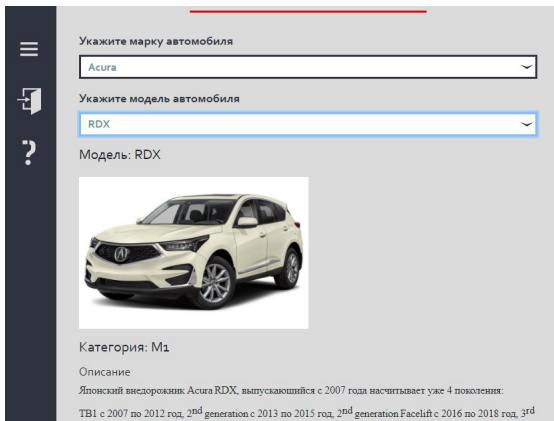


Figure 2. Car directory in the accident.zone environment.

To manage software development risks, the following basic indicators of the earned value method can be used:

- cost variance (CV). This indicator makes it possible to answer the following question: “Is the project within or beyond the budget being determined by an increase in variable expenses of the expert organization for the period of investing in the development of software and a database?”

$$CV = EV - AC \quad (3)$$

where: EV is the investment earned value, AC is the actual cost.

The cost variance can also be expressed in percent by the following equation:

$$CV_p = 100 \times (EV - AC)/EV = 100 \times CV/EV, (\%) \quad (4)$$

- schedule variance (SV).

$$SV = EV - PV \quad (5)$$

Despite the fact that the estimates obtained using this method describe the existing situation regarding software/database development more adequately, they still require a clear understanding of planned expenditures for each stage of development and its timelines. Rational planning of investments, which in this case affect variable expenses, can also be assessed at each stage within the framework of risk management, thus making it possible to manage business risks. Figure 3 shows a software/database quality checklist according to ISO 9126.

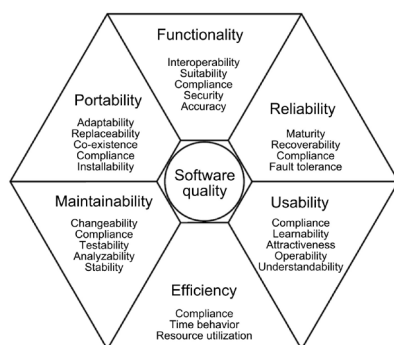


Figure 3. Software quality characteristics and attributes according to ISO 9126.

If complex software is developed, then relative independence of task sets matters as it makes it possible to develop and implement those in parallel or in sequence depending on the financial possibilities of an organization. The design of individual sub-tasks simplifies system adaptation to conditions of a particular enterprise (Polozov, 2010).

The functional aspect of risk management includes quantitative and qualitative risk assessment, planning and implementation of actions to prevent possible negative consequences, control of their execution, and constant monitoring for the purposes of identifying new risk areas (Vorobyova, 2014). All this is possible if modern risk management systems (also represented by software) are used. For instance, using the software solution mentioned above, it is possible to make instantaneous calculations for all risk types and factors in any expert organization, and score the business (Figure 4).

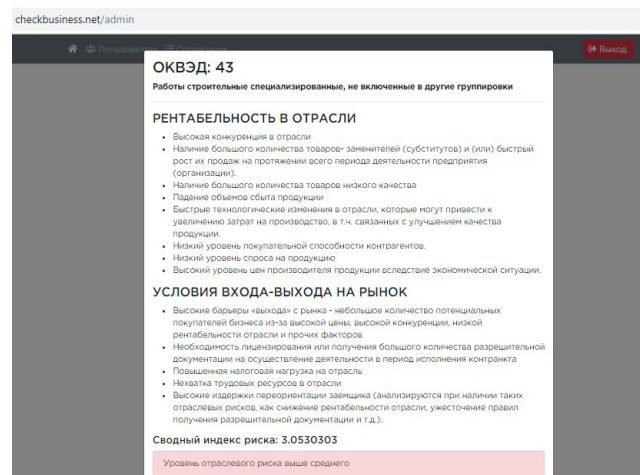


Figure 4. Operation of the organization risk management program located on the checkbusiness.net website (example).

## Results

The influence of software development and implementation on internal factors associated with business activities is conditioned by processes occurring during the manufacturing and sales of products and can, in turn, affect business results. American economists Kaplan and Norton made several assumptions, based on which it is necessary to build company operations and management under conditions of business informatization. In particular, they pay attention to requirements for business process flexibility and integration when new technologies are created, greater customer segmentation (when diversified products of the information society replace standard products of the industrial society), business scalability, requirements to reduce the life cycle of a product (e.g. software product) as a result of continuous innovations (competitive advantages at one of the stages of the product life cycle do not guarantee that the product will maintain the leading position at the

next stage of technological transformations) (Kaplan and Norton, 1996).

Thus, software development and implementation in the field of motor vehicle examination not only significantly

improve the technical and economic performance of an expert organization but also comply with standards of business conduct in the information society in general.

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## ЦИФРОВИЗАЦИЯ КАК ФАКТОР УПРАВЛЕНИЯ РИСКАМИ НАУЧНО-ПРОИЗВОДСТВЕННОЙ ОРГАНИЗАЦИИ НА ПРИМЕРЕ АВТОТЕХНИЧЕСКИХ ЭКСПЕРТИЗ

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### Аннотация

**Введение.** Учет базового уровня отраслевого риска в отрасли экспертных услуг, остается недопустимо высоким вследствие влияния существенного количества факторов. **Цель исследования.** Изучение влияния факторов риска предприятия при цифровизации производства продукции в экспертной деятельности. **Методы.** Использование контент анализа жизненного цикла ПО для расчета дисконтируемого периода чистого операционного дохода предприятия при введении системы оценки качества, разрабатываемого ПО и переходе на короткие итерации продаж. **Результаты.** Внедрение ПО в области автотехнических экспертиз не только существенно улучшает технико-экономические показатели экспертной организации, но и соответствует нормам ведения бизнеса в новом информационном обществе в целом.

### Ключевые слова

Управление рисками, использование онлайн программ для экспертизы дорожно-транспортных происшествий (ДТП), цифровизация, специальное программное обеспечение.